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ABSTRACT

This report presents an effective, integrated learning strategy program emphasizing a connection technique that uses paraphrasing. Components were derived from a review of the educational and psychological literature and from an analysis of responses to the learning strategy inventory, which were conducted during this same research effort. (See SO 008 594 for a report on the inventory.) Also, two other training packages (visual imagery and question-answer connection) were evaluated along with this package in a controlled experiment. (See SO 008 593 for discussion of the controlled experiment.) The results of this experiment showed a 55 percent improvement in long-term retention when using paraphrasing for the trained group, compared with an untrained control group. With appropriate insertion of blank pages for answers, this report can be used to provide learning strategy training. (Author/ND)

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LEARNING STRATEGY TRAINING
PARAPHRASING STRATEGY FOR EFFECTIVE LEARNING

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June 1975
Final Report for Period January 1974 – May 1975

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This final report was submitted by the Institute for the Study of Cognitive Systems, Department of Psychology, Texas Christian University, Fort Worth, Texas 76129, under contract F41609-74-C-0013, project 1121, with Technical Training Division, Air Force Human Resources Laboratory (AFSC), Lowry Air Force Base, Colorado 80230. Dr. Gerard M. Deignan, Instructional Design Section, and Dr. Ronald W. Spangenberg, Instructional Technology Branch, shared the contract monitorship.

This report has been reviewed and cleared for open publication and/or public release by the appropriate Office of Information (OI) in accordance with AFR 190-17 and DoDD 5230.9. There is no objection to unlimited distribution of this report to the public at large, or by DDC to the National Technical Information Service (NTIS).

This technical report has been reviewed and is approved.

MARTY R. ROCKWAY, Technical Director
Technical Training Division

Approved for publication.

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This report presents an effective integrated learning strategy program emphasizing a connection technique using paraphrasing. The components were derived from a review of the educational and psychological literature and from an analysis of the responses to the learning strategy inventory, which were conducted during this same research effort. Also, two other training packages (visual imagery and question-answer connection) were evaluated along with this package in a controlled experiment. The results of this experiment showed improved long term retention, when using paraphrasing for the trained group, of 55% over an untrained control group. With appropriate insertion of blank pages this report can be used to provide learning strategy training.

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SUMMARY

Problem

Academic performance differences within equal ability groups have been correlated with the way students select and use differing information processing strategies. In fact, information processing or learning strategies may be more fundamental determinants of learning performances than actual abilities. Further, training in how to select and use more efficient techniques and strategies for selecting, storing, manipulating and outputting information should enhance learning performance. Sources of information and strategies for processing information presently used by high and low ability students can be related to student performance, thus identifying strategies which can be used by the student to improve his performance. These validated information processing strategies can be used to help improve student performance in the Air Force training system. The initial requirement is based on the needs within the Advanced Instructional System to identify performance facilitating strategies. The strategies should enable improved learning performance and transfer of training to the job situation.

Approach

The identification of effective strategies has been accomplished using information gathered from a review of the educational and psychological research literature dealing with strategies, and from an analysis of responses to the specially developed Learning Strategy Inventory (see Dansereau, Long, McDonald, & Actkinson, 1975). The results of research with the Inventory indicated that students could be profitably trained on four aspects of the learning process: the identification of important, unfamiliar, and difficult material, the application of techniques for the comprehension and retention of this identified material, the efficient retrieval of this information under appropriate circumstances, and the effective coping with internal and external distractions while these other processes are being employed.

After these four areas of needed improvement were identified, specific strategies relating to each of these aspects were extrapolated from the educational and psychological literature. The process of applying techniques for enhanced comprehension and retention was believed to be most critical, consequently three alternative comprehension and retention techniques or strategies were extrapolated (paraphrasing question-answering, and the use of visual imagery). Methods for training the strategies related to the four aspects of the learning process were developed and combined in an integrated, training program.

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Results

A training program emphasizing the paraphrase connection technique was developed and evaluated. The program contains exercises in: making understanding ratings, retrieval training, a paraphrase connection technique, and materials for use under conditions of audio distraction for concentration training. This training program was tested and found effective. The results of the evaluation are reported in Dansereau and others (1975).

Conclusions

This training program, with appropriate insertion of blank pages, can be used to provide learning strategy training. It is further recommended that this program be expanded by including additional reading materials selected from the projected or actual career field of the potential user to gain the maximum benefit.

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PREFACE

This report presents a learning strategy training program which emphasizes a connection technique using paraphrasing. The development and evaluation of this training program is reported in Dansereau, McDonald, Long, Actkinson, Ellis, Collins, Williams, and Evans, 1975. Research was accomplished under Project 1121, Advanced Technology for Air Force Technical Training. Dr. Marty R. Rockway was the Project Scientist, Dr. Gerald Deignan was the Task Scientist until 1 June 1974, and Dr. Ronald Spangenberg was the Task Scientist from 1 June 1974 to the present. Research contained in this report was conducted under the provisions of Contract Number F41609-74-C-0013 with Texas Christian University, Institute for the Study of Cognitive Systems, Fort Worth, Texas, 76129. Dr. Donald F. Dansereau was the Principal Investigator.

Cooperation of Dr. James Baerwald, Psychology Department, University of Texas at Arlington and Drs. Howard Clark and Larry Wise, Texas Wesleyan College in recruitment of student subjects was deeply appreciated. The excellent combined coordination and cooperation of the Texas Christian University Psychology Department Faculty, Drs. Virginia Jarratt and Mildred Hogstel of the Harris School of Nursing, Dr. Jo James, School of Education, Dr. W. E. Tucker, Graduate Dean-Religion, and Dr. W. L. Reed, Dean of Undergraduate Religion, in encouraging students to participate as subjects played an important role in completing this training program.

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INTRODUCTION

Paraphrasing for Effective Learning is an integrated learning strategy program developed to improve students performance in academic tasks. Four aspects of the learning process were identified and selected for training. These are (1) the identification of important, difficult, and unfamiliar material, (2) the application of techniques for the comprehension and retention of the identified material, (3) the efficient retrieval of the information under appropriate circumstances and (4) the effective coping with internal and external distractions while the above processes are occurring. A training program for the first three aspects is contained in this report. The fourth aspect which incorporates audio distractions of varying levels of interest and loudness can be accomplished by presenting the appropriate exercises under conditions of audio distractions.

The identification of trainable aspects of the learning process was accomplished by a literature review and a survey of commonly used learning strategies. This extensive review of the learning strategy-related educational and psychological literature is reported in Dansereau, Actkinson, Long, and McDonald (1974). The development, administration, and analyses of responses to a two-hundred item Learning Strategy Inventory, designed to tap students' knowledge and use of various learning techniques, is reported in Dansereau, Long, McDonald, and Actkinson (1975). After the four trainable aspects were identified, specific strategies underlying each of these aspects were incorporated into three coherent, integrated strategy training programs. Training in identifying important, difficult, and unfamiliar material and retrieval training is identical in the three programs. However, different connection techniques designed to enhance comprehension and retention of narrative materials are emphasized in the three programs. This report describes the training program which emphasizes the use of "paraphrasing."

An informal assessment of the three training programs was conducted in the context of a pilot study. A different group of students was given each of the three programs, while a fourth group, not receiving any special training, served as a control. The three programs were modified, streamlined, and improved on the basis of the pilot study results.

A formal assessment study was then conducted (see Figure 1) to evaluate the three programs. The results (reported in Dansereau, McDonald, Long, Actkinson, Ellis, Collins, Williams, and Evans (1975)) indicated that the performance scores following the training program emphasizing the paraphrasing connection technique provided significantly higher delayed recall scores of the control group. Specifically, the retention scores were 55% higher than the control group's five days

00010

Introduction to the Training Program
Administration of the Delta Vocabulary Test
Understanding Judgments: Instruction and Experience (A 15 item test over the 1000 word training passage is included in this phase)
Retrieval Strategy Training: Instruction and Experience (Difficult retrievals of material in the "Understanding" passage and the news media)
Question-Answer Connection Training
Paraphrase Connection Training
Imagery Connection Training
Concentration Experience (Three 1000 word passages read under three levels of auditory distraction followed by a 45 item test (15 items/passage))
Reading of the four 1000 word training assessment passages (the last under moderate auditory distraction)
Training Assessment Phase
Further Individual Difference Measures: the Rotter I-E and Imagery Self Report Scales
Testing On the Four Training Assessment Passages (An 80 item test, 20 items per passage)
Post Assessment Test (Essay test on the four training assessment passages) and a Post-Training Questionnaire
Control Group (not shown in the schematic) received the Introduction to the Training Program, the Delta Vocabulary Test, Understanding Judgment Training, the Training Assessment Phase, the Individual Differences Measures and the Post Assessment Test.

Formal Assessment Study
Schematic of the Training
Program Treatments
Figure 1

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after the original learning. All students benefited from the training program, although the best performance was demonstrated by the high verbal ability group.

The program which follows consists of components which train: self rating of understanding (20 minutes), information retrieval techniques (45 minutes), and the use of paraphrasing for improving comprehension and retention (135 minutes). The time for the concentration experience with audio distractions associated with these components was 55 minutes.

For using this program it is recommended that blank sheets and duplicate test forms be inserted at the appropriate places for student use. Further it is strongly recommended that all aspects of the program be expanded by the use of material from the projected or actual career field of the potential user. Specifically a minimum of five additional passages should be incorporated in the development of self-rating of understanding. Information retrieval techniques should be applied to at least two of the additional passages. Following the paraphrase training selections included in this document, a minimum of ten additional reading selections from the appropriate career field should be selected to provide additional practice. Following this training an additional two to four hours may be presented under conditions of distraction by adding technical material related to the users career field to the included materials. Student instructions reflecting the modifications must also be prepared.

00012

UNDERSTANDING RATINGS:

CHOOSING WHEN TO APPLY THE CONNECTION TECHNIQUE

Please insert blank pages at appropriate places prior to using this section

Estimated Time for Included Materials is 20 Minutes.

00013

Name_____

Understanding Ratings

When you study a textbook, you probably make some decisions about how well you understand each passage or section. For the purposes of this training program, we would like you to get some practice in making this type of judgment formally. First, consciously making understanding judgments may improve your ability to determine what material needs further review, and second, these judgments will be used in other parts of the training we will be giving you. What we are going to ask you to do is read a fairly long passage and periodically make understanding judgments. Please look at the scale on the following page. This is the scale we will ask you to use. Your job is to rate your understanding of the material you have read since your last judgment by choosing the number of the statement that best describes your level of understanding. Your level of understanding may fall in between two of the statements, so you can use the numbers between the statements to indicate just where it falls. I'll give you a minute or so to look over the scale in order to see if you have any questions.

Any Questions!

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Understanding Rating

Please note that the rating scale statements not only deal with how well you have understood the paragraph in the traditional sense but also how well you will be able to remember the information in order to explain it at some future time. Thus, your rating should reflect both how well you understood the paragraph and how well you will be able to remember it.

(1) It would be impossible for me to explain this material to another individual in the future.

(2)

(3)

(4)

(5) I could roughly explain this material to another individual in the future.

(6)

(7)

(8)

(9) It would be very easy for me to explain this material in great detail to another individual in the future.

Please remember your understanding ratings should include not only how well you can follow the material as you are reading, but also how well you feel you will be able to remember the material in the future. If you can't follow what is being said or if you don't think you will be able to remember it, your rating should be close to (1). If you can easily follow the material and would have no trouble in remembering it your rating should be close to (9). If you feel your understanding falls somewhere between these two extremes choose a number more towards the middle of the scale as your rating.

You will make your ratings in the spaces provided within the reading material. After the passage you will be given some questions to let you know how well you did.

You are now ready to start your ratings of the material. Please refer back to the understanding rating scale as often as necessary so that your ratings will be accurate. You will be given 10 minutes to read and rate the passage which is contained on Pages 12 to 15. When you reach Page 15, please stop. You may go back and review the material and your ratings but do not go beyond Page 15 until I have given further instructions.

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Fighting between members of the same species is almost universal among vertebrates, from fish to man. Casual observation suggests the reason: Animals of the same kind, occupying the same niche in nature, must compete for the same food, the same nesting sites and the same building materials. Fighting among animals of the same species therefore serves the important function of "spacing out" the individuals or groups in the area they occupy. It thereby secures for each the minimum territory required to support its existence, prevents overcrowding and promotes the distribution of the species. Fighting also arises from competition for mates, and thus serves to select the stronger and fitter individuals for propagation of the species. It is no wonder, then, that herbivores seem to fight each other as readily as do carnivores, and that nearly all groups of vertebrates, except perhaps some amphibians, display aggressive behavior.

Understanding_____

A complete investigation of fighting behavior must take account, however, of another general observation: Fights between individuals of the same species almost never end in death and rarely result in serious injury to either combatant. Such fights, in fact, are often highly ritualized and more nearly resemble a tournament than a mortal struggle. If this were not the case--if the loser were killed or seriously injured--fighting would have grave disadvantages for the species. The animal that loses a fight is not necessarily less healthy or less viable; it may simply be an immature animal that cannot withstand the attack of a mature one.

Understanding_____

In view of the disadvantages of serious injury to a member of the species, evolution might be expected to have exerted a strong selective pressure against aggressive behavior. But spacing out through combat was apparently too important to permit a weakening of aggressive tendencies; in fact, aggressiveness seems to have been favored by natural selection. It is in order to allow spacing out--rather than death or injury--to result from fighting that the ceremonial combat routines have evolved.

Understanding_____

Investigators of aggressive behavior, often strongly motivated by concern about aggressive impulses in man, have usually been satisfied to find its origin in the life experience of the individual animal or of the social group. Aggressiveness is said to be learned and so to be preventable by teaching or conditioning. A growing body of evidence from observations in the field and experiments in the laboratory, however, points to the conclusion that this vital mode of behavior is not learned by the individual but is innate in the species, like the organs specially evolved for such combat in many animals. The ceremonial fighting routines that have developed in the course of evolution are highly characteristic for each species; they are faithfully followed in fights between members of the species and are almost never violated.

Understanding_____

All-out fights between animals of the same species do occur, but usually in species having no weapons that can inflict mortal injury. Biting animals that can kill or seriously injure one another are usually also capable of quick flight. They may engage in damaging fights, but these end when the loser makes a fast getaway. They may also "surrender," by assuming a submissive posture that the winner respects. Konrad Z. Lorenz of the Max Planck Institute for the Physiology of Behavior in Germany has described such behavior in wolves and dogs. The fight begins with an exchange of bites; as soon as one contestant begins to lose, however, it exposes its vulnerable throat to its opponent by turning its head away. This act of submission immediately inhibits further attack by its rival. A young dog often submits by throwing itself on its back, exposing its belly: a pet dog may assume this posture if its master so much as raises his voice. Analogous behavior is common in birds: a young rail attacked by an adult turns the back of its head--the most sensitive part of its body--toward the aggressor, which immediately stops pecking. Lorenz has pointed out that acts of submission play a similar role in fights between men. When a victim throws himself defenseless at his enemy's feet, the normal human being is strongly inhibited from further aggression. This mechanism may now have lost its adaptive value in human affairs, because modern weapons can kill so quickly and from such long distances that the attacked individual has little opportunity to appeal to his opponent's feelings.

Understanding_____

Most animals depend neither on flight nor on surrender to avoid damaging fights. Instead they engage in a ceremonial struggle, in the course of which the contestants measure their strength in bodily contact without harming each other seriously. Often these contests begin with a duel of threats--posturings, movements and noises--designed to cow the opponent without any physical contact at all. Sometimes this competition in bravado brings about a decision; usually it is preliminary to the remainder of the tournament.

Understanding _____

On the lava cliffs of the Galapagos Islands a few years ago I observed such contests between marine iguanas (Amblyrhynchus cristatus), large algae-eating lizards that swarm by the hundreds over the rocks close to shore. During the breeding season each male establishes a small territory by defending a few square yards of rock on which he lives with several females. If another male approaches the territorial border, the local iguana responds with a "display." He opens his mouth and nods his head, presents his flank to his opponent and parades, stiff-legged, back and forth, his apparent size enlarged by the erection of his dorsal crest. If this performance does not drive the rival off, the resident of the territory attacks, rushing at the intruder with his head lowered. The interloper lowers his head in turn and the two clash, the tops of their heads striking together. Each tries to push the other backward. If neither gives way, they pause, back off, nod at each other and try again. (In an apparent adaptation to this mode of combat the head of the marine iguana is covered with horn-like scales.) The struggle ends when one of the iguanas assumes the posture of submission, crouching on its belly. The winner thereupon stops charging and waits in the threatening, stiff-legged stance until the loser retreats. A damaging fight is triggered only when an invader does not perform the ceremonies that signal a tournament; when, for example, the animal is suddenly placed in occupied territory by a man, or crosses another animal's territory in precipitous flight from an earlier contest. On these occasions the territory owner attacks by biting the intruder in the nape of the neck. Female iguanas, on the other hand, regularly engage in damaging fights for the scarce egg-laying sites, biting and shaking each other vigorously.

Understanding _____

00019

The lava lizard (Tropidurus albemarlensis) of the larger Galapagos Islands engages in a similar ceremonial fight that begins with the rivals facing each other, nodding their heads. Suddenly one of them rushes forward, stands alongside his opponent and lashes him with his tail once or several times, so hard that the blows can be heard several yards away. The opponent may reply with a tail-beating of his own. Then the attacker turns and retreats to his original position. The entire procedure is repeated until one of the lizards gives up and flees.

Understanding _____

According to Gertraud Kitzler of the University of Vienna, fights between lizards of the central European species Lacerta Agilis may terminate in a curious manner. After an introductory display one lizard grasps the other's neck in his jaws. The attacked lizard waits quietly for the grip to loosen, then takes his turn at biting. The exchange continues until one lizard runs away. Often, however, it is the biter, not the bitten, that does the fleeing. The loser apparently recognizes the superiority of the winner not only by the strength of the latter's bite but also by his unyielding resistance to being bitten.

Understanding _____

00020

1) Aggressive behavior which seems to be characteristic of nearly all vertebrates serves several useful purposes. Name one.

_____

2) Fights between individuals of the same species (a) often (b) rarely (c) never end in serious injury to both/either participant(s).

_____

3) The universality of fighting among animals would imply that aggressiveness has been favored by _____ _____.

4) Current research seems to indicate that aggressive behavior is learned by the species.

True_____ False_____

5) An animal may surrender and avoid further injury by assuming a _____ _____.

6) This mechanism for avoiding serious injury is particularly valuable to human beings today due to new technological advances.

True_____ False_____

7) The lava lizard "fights" until one of the participants is killed.

True_____ False_____

8) Other lizards may be victorious in a fight by their ability to withstand _____ _____.

9) In a _____ struggle, participants compare their strength in bodily contact without inflicting serious injury on each other.

00021

10) The fact that ceremonial fighting routines are highly characteristic for each species and are faithfully followed in fights among members of the species has been used to conclude that aggressiveness is _____.

11) Biting animals that can kill or seriously injure one another are usually also capable of _____ _____.

12) A young dog who throws itself on its back exposing its belly is exhibiting a _____ _____.

13) Unlike males, female iguanas often engage in damaging fights.

True____ False____

14) A male iguana performs a "display" as a last ditch effort to drive an intruder off.

True____ False____

15) List one reason why fighting may occur.

_____

RETRIEVAL TRAINING:

WHEN AND HOW

Please insert blank pages at appropriate places prior to using this section

Estimated Time for Included Materials is 45 Minutes.

00023

NAME_____

Retrieval Training

When you take a test you have to retrieve from your memory information that you learned at some previous time. Probably a lot of your test-taking time is spent in this retrieval effort - in deciding what you might be able to retrieve and in trying to remember it. We've been examining the problem of retrieving information and we've isolated some methods that might be useful to you.

Of course, you already know something about retrieving information. You've been doing it for years. But many of the things you do are carried out rapidly and not really at a conscious level. In much less time than it takes to tell, you analyze a question to determine if you can retrieve the needed material, you decide how much effort is needed and select a way to carry out the retrieval. Except under special circumstances, this goes on so fast that you don't really become aware of it.

We have two general goals for you during this part of the training program:

First, we will help you become more aware of the retrieval processes you have been using to recall information.

Second, we will show you some procedures that people have found to be particularly effective in retrieving information from memory.

This retrieval training unit will begin with instructions on two topics: first, what methods are useful in accomplishing retrieval, and, second, how to decide whether a retrieval effort is likely to pay off. After that, we will give you some practice in using the retrieval methods.

00024

Retrieval Methods

Two methods have proved useful in retrieving information from memory: the use of incidental cues and the use of cues related to the organization of the material. In most tasks both of these methods can be used, but in retrieving information for an exam, cues from the organization of the material are generally more effective. We will describe each of these methods here and then move on to give you information on when to use them and some actual practice in their use.

Incidental Cues

As we said earlier, people often can recall something about the material they are trying to retrieve from memory. What they recall about the material is somewhat connected to it; we will refer to each of these recalled items as a cue. When a person searches for the answer to a test question, cues like these are often used to aid retrieval:

(1) Was the material presented in class or in the text?

(2) If in class:
   (a) Which lecture?
   (b) How was the lecturer dressed?
   (c) Was it put on the board?
   (d) Was it put in my notes?

(3) If the material was from the text or my notes:
   (a) Where on the page was it located?
   (b) Was there a picture on that page?
   (c) Was the material underlined?
   (d) What color ink was used in the underlining?

Cues of this sort are basically incidental cues. They are not meaningfully connected to the target material. In other words, they are related to the target material only because they were present when the material was stored. That does not mean they can't be helpful--they can. In fact, as we will see later, incidental cues can actually be created and then used later in recalling the information. This technique is the one usually employed by people who have phenomenal memories.

Organizational Cues

Most material presented in the classroom has organizational cues of its own. That is, a concept presented in a course quite often is related to concepts that came before and others that come after it. This organization, or logical progression, of the material can be helpful when you are trying to retrieve information stored at a previous time. The way you go about using the organization is to start at some familiar position within the organization and then move toward the target you are trying to retrieve. Following is an example in which a student used the organizational cues of the material to help his retrieval.

Question:

What is the method by which the President of the United States is impeached and removed from office? Be as specific as possible.

Student's Thoughts During Retrieval:

Well, let's see, the President is Chief of the executive branch and there are three branches of government: legislative, executive and judicial. Obviously the impeachment of a President would have to be done by one of the other branches. Impeachment is sort of like a trial, I think, so that might suggest that the judicial branch would be involved. Since it's at the level of the President, any action on impeachment would have to come from the highest level of the judicial branch: the Supreme Court. But the President appoints the members of the Supreme Court so it doesn't seem to make much sense for impeachment to be handled by just them. What about the legislative branch? That's Congress. Well, there are two houses in Congress, and I remember that they don't have exactly the same kinds of responsibilities under the Constitution, because only the Senate is required to confirm Presidential appointments. I think both houses of Congress are involved but not in the same way. Does impeachment

have several parts in it then? Come to think of it, it must, because the question says "impeached and removed from office." So there must be two separate things, and besides I remember that Andrew Johnson was impeached, but he wasn't removed from office. So impeachment must be like bringing charges in a trial, and then somebody decides whether he actually is removed from office. Trial...it seems to me the trial is conducted by the Senate. That would mean that somebody else presumably has to bring the charges. I think the House of Representatives must do that, so what would happen in an impeachment is that the House of Representatives decides whether to bring charges, and if it does, then the President is impeached, meaning that he is brought to trial by the Senate. I still think the Supreme Court must be involved somehow. I wonder if some judge-maybe the Chief Justice--would be presiding at the trial. Let's see, if it's a trial it would make sense to have a judge presiding, and beside that, who else could preside? Normally, the presiding officer of the Senate would be the Vice President. Well, it wouldn't make much sense to have the Vice President, who would be next in line to become President, presiding over the President's trial. So I think maybe I would risk saying that the trial is done in the Senate with the Chief Justice of the Supreme Court presiding.

Notice that retrieving the answer, the student first focused on a part of the material he was familiar with (the president is in the executive branch) and then used this organizational cue to retrieve the other two branches and finally the answer to the question.

From this simple example you can see that the organizational cues of the material can be used to help retrieval. These cues are different from the incidental cues discussed previously because they are usually meaningfully related to the material being retrieved. Some examples of organizational cues that can be used in retrieval are as follows:

(1) What category is the material in? (e.g., animal, mineral, or vegetable; living or dead; male or female; etc.)--Using this type of cue would be similar to playing the game of "Twenty Questions" in which you are trying to determine what a person is thinking of by asking a series of questions.

(2) When did the event occur? What things happened about the same time? (e.g., the Model A Ford came after the Model T; Babe Ruth hit 60 home runs before WWII; the Beatles were most popular when Kennedy was President.)

(3) Where in the hierarchy of material did the target information occur? (e.g., What unit of the course did the material occur?; In what chapter?; What branch of government is responsible for impeachment?; etc.)

Before giving you practice in using incidental and organizational cues as aids to retrieval, you need to know when to attempt retrieval. The following section explains when to retrievel.

How to tell when retrieval is worth trying:

In taking tests you no doubt found that your ability to recall the answer to a question tended to fall in one of the three categories. For many questions you recalled the answer without effort. For a few questions you probably felt that you simply didn't have the information and no amount of searching would get it. But many of the questions that you couldn't answer probably fell in an intermediate category. You felt that you did know the answer, but you could not recall it immediately.

Research has shown that your feelings about whether you know something are probably quite accurate. In other words, the more strongly you feel that you know something, even though you have not yet remembered it, the more likely it is that you will be able to remember it.

Such feelings are usually based on the fact that even when you cannot remember the material itself, you can sometimes remember cues which are related to the material. People talk about such cues when they report their efforts to remember: "I know I read it. It was right at the top of a page." "I can see it in my imagination, but not quite clearly enough to get the answer." "His name begins with a 'C', and it sounds like something unpleasant."

Probably the most striking example of the role of cues is the familiar experience of having something "on the tip of your tongue." You are asked perhaps to remember someone's name when you have not heard the name for some time. You can remember what the person looked like, how he behaved, and you can remember some things about the name: the first letter, perhaps, whether it was long or short, and possibly some other names that sound much like it.

You may have felt that all those cues were getting in your way as you tried to remember, but experiments have shown that when a person does not recall a word immediately, the more cues he can recall, the more likely it is that he will eventually be able to recall the word itself. So you can use the number of cues available to you as an indication of how likely you are to be able to retrieve the material. Remember, the more cues, the better the chances of recall.

Now, assuming that you have decided that you want to try to retrieve something, how do you go about it? Are there any skills that will help you put the cues together to retrieve the material. The next section will try to answer this question.

00029

How do you use organizational and incidental cues or connections from memory?

The first rule is: divide and conquer. That is, you divide the question into sub-questions and try to answer these first. The sub-questions are not separate parts of the original question, but rather, they are questions related to the organization of the material and to the placement of the target information in that organization. Since different people may have somewhat different organizations for the same body of material, the questions may only make sense to the person who is attempting recall. Nevertheless, there are some general principles that can be identified.

For example, if you are attempting to recall the time of a historical event, you might try to think what other events are associated with it in time. You might think what events logically must have come just before it, or just after it. If you identified events of that sort, they might help you fix the time of the target event.

More generally, the first sub-question might be: What do I know about things related to the target information, especially about things having some logical relationship? Once those things have been identified, you would have to find specific questions for yourself, always trying to choose questions such that, if you knew their answers, you would be closer to having the target information.

In summary, here is an outline of the steps that you should go through in using organization as a retrieval method:

(1) Try to think of other information which is logically or incidentally connected to the target.

(2) On the basis of how much connected information you can think of , and your general feelings about whether you know the target material, make a decision as to whether to attempt retrieval or not.

(3) If you are going to attempt retrieval, use the connected information to form sub-questions which seem reasonable to you.

(4) As you answer some of the sub-questions, use this information, if necessary, to develop new sub-questions.

(5) Continue the above step until you either find the information or feel that you are running out of new leads, in which case it may be time to stop.

(6) Some people find that after a vigorous effort to retrieve a piece of information, it is useful to go on to something else and return to the effort later. In a test situation this would mean working on a question for awhile, going on to other questions, and then coming back to the original question and trying again. Sometimes in answering questions cues will be remembered that will help in answering other questions.

To give you experience in retrieving difficult material, we are going to give you a few questions and let you try the technique. On the first page of your handout you will find a question at the top. The first question relates to material presented in an earlier phase of this training program while the remaining questions are over news items. When I tell you to start, please turn the handout over, examine the question, and try to recall the answer. If you don't know the answer immediately, follow the procedure we have just gone over. Think of related information, use that to construct sub-questions, then write the sub-questions down in the blank space below the main question. After that, try to write down the answers to the sub-questions and continue until you remember the target material or feel that you have gone as far as you can.

When you have finished with the first question, turn to the next page and you will see the sub-questions and answers that one person thought of when he was trying to answer the question. Of course, that person's procedure will be different from yours, but by studying his responses you will better understand how retrieval is aided by incidental and organizational cues.

After you have studied the responses on the second page, go on to the third page and so on. When you reach the page entitled "Further Information on Retrieval" please stop and go back over your work on the questions. In particular you should read the descriptions of one person's attempts at retrieval very carefully. In fact, it might be good if you tried to determine when the person was using organizational cues and when he was using incidental cues. You will be given 25 minutes to go through the four questions and responses contained in this booklet.

Any Questions!

00032/033

Question: Based on the article you read during the first training exercise, what important function does fighting between members of the same species serve?

00034

Question: What important function does fighting between members of the same species serve?

Person's Thoughts During Retrieval:

Oh, I remember reading something about that... Let's see...what is useful about fighting? Well, what have I just read? A lizard wins a fight if he can withstand being bitten... Before the lizard was the ... iguana. I just remember a description of the fight. Well, what did I read before that? It seems like I was real distracted by people out in the hallway--this was about mid-way in the passage. I remember the author was describing the ceremonial aspects of fighting. Right! And the instructor left the room about the time I was reading about submissive postures. Let's see. I know that was at the bottom of the second page because I really had trouble evaluating my understanding of that paragraph. OK. Let's see...the importance of the ceremonial aspects of fighting was really stressed. Even on the first page. I remember reading that if a fight were to end in death, it would entail obvious disadvantages for the species. The ceremonial aspects evolved because aggressive behavior served such an important function. OK now--what was it! It had to be at the first of the passage. Let's see. The instructor had just finished telling us what to do. I began to read the first paragraph and kept getting distracted by the instructor. I kept re-reading the first few sentences for understanding. I was surprised to read that fighting was so universal. Wolves, dogs, Man. The author explained the reason--members of the same species occupy the same niche in the environment. They compete for the same territory, food, and mates. Right! I remember now! Fighting prevents crowding around limited resources by spacing out the animals.

00035

Question: When did the Cuban missile crisis occur?

00036

Question: When did the Cuban missile crisis occur?

Person's Thoughts During Retrieval:

Well, the first thing I remember was that--well, Kennedy handled it, and that would have been during his administration. And...he was elected in 1960, so that's the earliest date. The next question is--well, when was he assassinated? That'll catch it in time, I remember that he was assassinated in November...November 22, but what year? I couldn't remember that exactly. Um...I knew--I thought back to, What was I doing then? and I was in my office at Sadler Hall, but that doesn't clearly pick a year, because that's where I'd be most any November, I suppose, around then. Then, I considered--all right, what years could it have been? '61--obviously not, because he was in office more than one year. '62, '63, '64, couldn't have been after '64. Well let's see then, I figure '64 would be an election year and if he was assassinated in November he would already have been re-elected but I don't remember there being a campaign. As a matter of fact after thinking a minute I remember that in '64 Goldwater and Johnson were campaigning in the election, so Kennedy must have been assassinated before then. That seems to make it almost certainly 1963, since Kennedy did seem to have been in office a fairly long time, certainly 3 years seems more likely than 2. If that was the case, then when would the missile crisis have happened? Certainly in one of those three years. It seems to me that the missile crisis happened in a Fall, also, sometime in the Fall of one of those years, and the question would be which one. It didn't seem likely, it didn't seem that the assassination was that closely associated with the missile crisis. I should have thought there would have been a lot more ruckus about it if the two things had occurred in the same year, or at least in the same few-month period. So, when else? 1962 seems like a pretty likely year, and come to think of it, 1962 would have been a...a congressional election year, and now that I think of that I remember that there was a good deal of controversy

about the missile crisis. Some senator or representative claiming that missiles were being placed before the President actually took action and there was a good deal of ruckus about that, and then I remember that as a matter of fact some people accused Kennedy of scheduling a missile crisis so it would influence an election. Now with that I know for sure, almost sure, that it has to be 1962 because that's the only election that could have been involved, and that would put it in the Fall of 1962 before the first of November, I guess, sometime in October--late September or October if it was going to be--if he was going to be accused of scheduling it to influence the election. So that's the time I pick.

00038/039

Question: What teams played in the SuperBowl in 1972?

00040

Question: What teams played in the SuperBowl in 1972?

Person's Thoughts During Retrieval:

Let's see...this is 1974. Who played in the Super-Bowl this year? Well, I remember the Miami Dolphins won it, and the Dolphins have played in it before. In fact they won it two years in a row so that would be '73. But I remember they played in it before that. They played in it three years in a row but didn't win the first time. That would be '72. The Miami Dolphins was one of the teams and they lost. Now who beat them in the SuperBowl in '72? It seems to me that Washington was doing very well around then and so were the Dallas Cowboys, but I know the Dallas Cowboys won a SuperBowl somewhere around then. I'll bet the Dallas Cowboys was the other team and the winner.

Question: When did the "Kent State Massacre" occur?

00042

Question: When did the "Kent State Massacre" occur?

Person's Thoughts During Retrieval:

Let's see, I remember that John Mitchell was somehow involved in the investigation, so he would have been Attorney-General and this would have been in the Nixon Administration. It was the outgrowth of student riot, so there must have been something that had recently happened to trigger the riot. I have the vague impression that it was in the Spring around Easter time, and maybe the school closed down right after the shooting until the end of the Easter vacation. Mitchell stopped being Attorney-General in '72, but I think that was in the spring when he was getting ready to run Nixon's '72 campaign and there probably isn't enough time in that period for him to involve himself in the Kent State business. Besides, the investigation that he was involved in must have lasted for some months after the incident. Of course, that spring was when the bombing of North Viet Nam started, but somehow I don't recall any substantial student reaction to that. The activity must have been in reaction to something involving Viet Nam, however, the only other major thing I can think of was Nixon sending troops into Cambodia. I'll bet that's what it was. When would that have happened: Not '69, certainly. I think it's narrowed down to Spring 1970 or Spring 1971. That incursion was supposedly getting things ready for the South Vietnamese to take over more of their own defenses, so it would seem more likely that it was '70. I think I'll opt for that: Spring around Easter time, 1970.

Further Information on Retrieval

Even if you did not recall the correct answers to the questions you have been working on, you probably noticed that you came fairly close, narrowing the answer down to a few alternatives. In many cases (such as in multiple-choice and essay exams), narrowing down the possible alternatives may be enough to give you a good chance at a correct answer. Later on in the training program we will be giving you material to read and questions over the material. In answering these questions we would like you to use the retrieval methods we have been working on. The more practice you have on retrieval the better you will be able to use it in your courses.

You will no doubt have gathered from the retrieval exercises that the key to retrieval of material is in the connections, incidental and organizational, that get associated with it during learning. And you have probably jumped ahead of us to the realization that the best thing you can do about getting material out of memory is to see that the necessary cues or connections are associated with it when it goes in. This involves, of course, noticing and remembering the incidental and organizational connections that are already present. However, to even further improve your chance for remembering the material, you need to create other incidental and organizational connections.

One of the best ways to add organizational connections is to put the material you have just studied into a form that you can easily understand. This may involve re-wording the material, picturing it in your mind, or asking and answering important questions about the material. With all of these approaches you end up organizing the material in a way that forces it to fit in with things that you already know, thus you have more organizational connections to call on when you are ready to retrieve.

00044

Incidental connections can be produced while you are re-organizing the material. One way this can be done is by creating bizarre, novel, or unusual additions to the material. For example, if you are studying the differences between solids, liquids, and gases, you could imagine the molecules as tiny people dancing around at different speeds: standing almost still in the solids, waltzing in the liquids, and boogying in the gases. Or, if you are studying an historical event, you might imagine your friends or relatives as taking on the roles of the people involved in the events. Thus George Washington takes on the characteristics of your Uncle Frank and Betsey Ross becomes Ethel, the weird lady that lives down your street.

Although the above examples are a little far-fetched they illustrate a technique which has been shown by experiments to be very effective in aiding the recall of material. The more bizarre, unique, or weird the incidental connections are, the better they work during retrieval. In the next portion of the training program we are going to give you practice on forming additional organizational and incidental connections to course-like material. If you work hard at these exercises and use the techniques in your courses you should find the effectiveness of your studying greatly improved.

00045

USING PARAPHRASING

(FOR IMPROVING COMPREHENSION AND RETENTION)

Please insert blank pages at appropriate places
prior to using this section

Estimated Time for
Included Materials
is 135 Minutes.

00046

Introduction to the Paraphrase Connection Technique

In this part of the program we will be teaching you a connection technique that will help you form effective organizational and incidental connections or cues. You will remember from the previous session that if you don't remember something right away, the key to finding it in your memory is to find connections to it from things that you do remember. In the previous session, you were using connections or cues that just happened to be formed, but now we will work with a technique that develops the connections so that they will be there when you need them.

We have reviewed a large number of connection techniques and chosen three powerful ones for our training program. We believe that all of these techniques are about equally good, and if we had time we would teach all three to everyone. We don't have the time and staff to do that, however, and we think you will profit more by thorough training on one technique than you would by a smattering of all three. The paraphrase technique we will study in this group is a little different from the techniques being studied by other groups. Your instructor has been specifically trained to assist in learning this technique, and by working with a small group he will be better able to give you individual attention.

Of course, since you are in college, you have done a lot of studying, and have quite a bit of experience in trying to remember material at the time of a test. Of course, you may feel that you know the material well and do in fact perform well on exams; but maybe you aren't completely satisfied with the results, either because you don't remember all that you need to or because your studying takes too long. Actually, people aren't taught how to study in the same way that they are taught to add or subtract or do long division. They are just expected to pick it up as they go along. Our investigations have shown that students most commonly use just two study methods: note-taking and underlining. These are perfectly good study methods but they are not complete. They are simply methods to collect and record material that needs to be remembered.

00047

You have probably had the experience of reading a chapter in a book and remembering practically nothing of what you read. This occurs because fixing something in your memory is an active process. You have to do something with the material in order to fix it in memory. And, as matter of fact, you now know that what you have to do with the material is establish additional connections or cues which will let you find it when you need it. It is this part of the process that is usually left out in note-taking and under-lining. People spend a lot of effort in reviewing "underlined" or "note" material but they often merely read it, a method which only refreshes the connections or cues which were established in the first reading. It doesn't give any opportunity to build new connections.

In paraphrase training you read material and after every paragraph or so, you form a paraphrase or summary of the material that you have read. This requires active processing because in order to form the paraphrase you have to select the important ideas presented and determine how these ideas are related to each other. Furthermore the forming of a paraphrase produces new memory connections in addition to those normally developed during "straight" reading. The more bizarre, novel, or unique you make the paraphrase the more effective the incidental connections will be for retrieval.

Paraphrasing is a very efficient way of remembering material because it is a way of putting the ideas presented in your own words. Research has shown that students remember ideas stated in their own words far better than ideas stated by another person. So when you need to remember the material, you simply call up your novel paraphrase to find the information.

Those of us who have been working with this material and preparing it for your training session have been using the paraphrase connection technique for some time. We have found that it really is helpful in studying, but we are not promising that it is an easy, no-work solution to learning academic material. Like any other skill you might find useful, the paraphrase technique is difficult to use when you first start.

00048

It seems so much faster just to read straight through a passage without stopping, and of course it is faster, but speed doesn't pay off if you can't remember what you have read. As you practice the paraphrasing technique it will get easier and more automatic. In the long run, if you do practice the technique, you will be able to make substantially more efficient use of your study time.

Let's put it this way, learning to study is very much like learning a new sport. The key to success is hard work on the fundamental skills. Some of you may start getting bored and tired as you go through the connection training exercises. However, you should remember that working hard during this program will save you time and effort in studying for your courses. Since you are going to be here anyway you may as well give it your best shot.

If there aren't any questions we are now ready to start with the first part of your Paraphrase Connection Technique Training.

The Relationship Between the Passage and the Paraphrase

We are going to start by giving you experience with paraphrases that are not particularly bizarre or unique. These paraphrases do, however, provide an alternate way of viewing the main ideas presented in the passage and, consequently should help you understand and remember the material. Later in the program we will give you experience in making material even more memorable through the creation of unusual paraphrases.

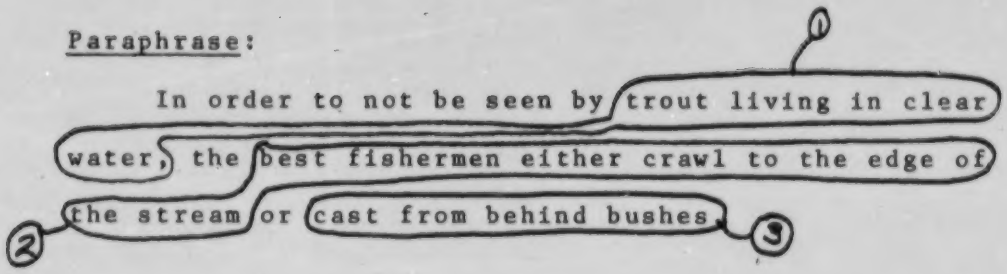
For the present you will be given five paragraphs. Underneath each paragraph is a paraphrase that we have especially constructed to help in remembering the material presented in the paragraph. Parts of the paraphrase have been circled and numbered. You are to circle and number the parts of the paraphrase. You will then turn the page and see if your circling and numbering of the paragraph corresponds to ours. By doing this you can see what we thought the main ideas of the paragraph were, and you can also see what we mean by a relevant paraphrase.

You will have four (4) minutes to go through the five paragraphs. When you reach the next set of instructions, please stop.

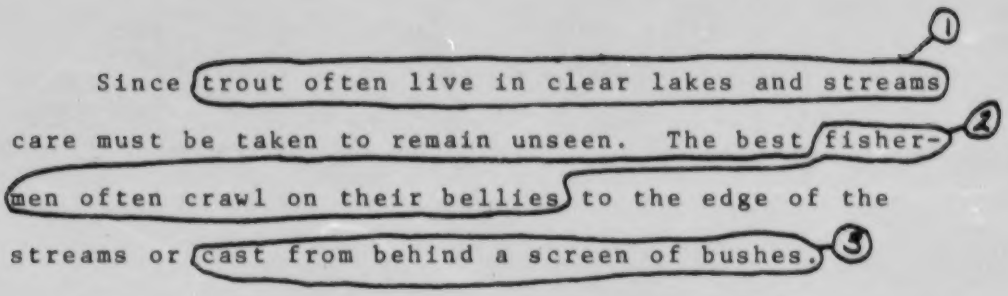
00050/051

Since trout often live in clear lakes and streams, care must be taken to remain unseen. The best fishermen often crawl on their bellies to the edge of the streams or cast from behind a screen of bushes.

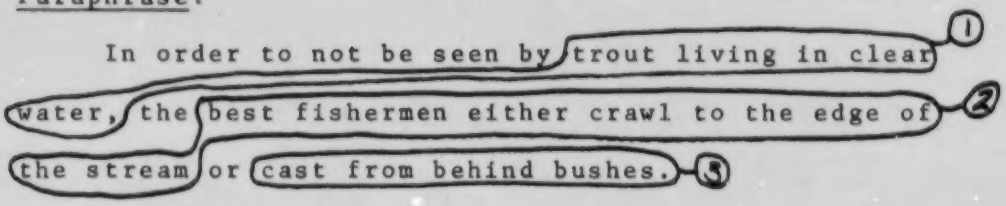
Paraphrase:


1
In order to not be seen by trout living in clear water, the best fishermen either crawl to the edge of the stream or cast from behind bushes.
2
3

00052


Since trout often live in clear lakes and streams
1
care must be taken to remain unseen. The best fisher-
2
men often crawl on their bellies to the edge of the
streams or cast from behind a screen of bushes.
3

Paraphrase:


In order to not be seen by trout living in clear
1
water, the best fishermen either crawl to the edge of
2
the stream or cast from behind bushes.
3

00053

The most hopeful sign for the future is the attempt by the rebellious young to reject our social values. Their protests indicate that mankind is becoming disturbed by increasing dehumanization and so may act in time to reverse the trend. Despite so many intellectual and ethical setbacks, despite so much evidence that human values are being spoiled or cheapened, despite the massive destruction of beauty and of natural resources, as long as there are rebels in our midst, there is reason to hope that our society can be saved.

Paraphrase:

There is still hope for our society while there are young rebels in our midst protesting the destruction of our natural resources, the cheapening of our human values, and the dehumanization of man.

00054

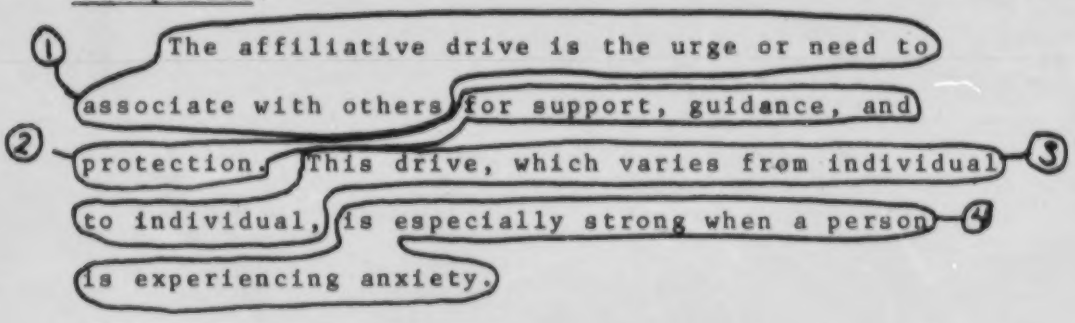
The most hopeful sign for the future is the attempt by the rebellious young to reject our social values. Their protests indicate that mankind is becoming disturbed by increasing dehumanization and so may act in time to reverse the trend. Despite so many intellectual and ethical setbacks, despite so much evidence that human values are being spoiled or cheapened, despite the massive destruction of beauty and of natural resources, as long as there are rebels in our midst, there is reason to hope that our society can be saved.

Paraphrase:

There is still hope for our society while there are young rebels in our midst protesting the distruction of our natural resources, the cheapening of our human values, and the dehumanization of man.

Affiliative drive is the urge or need to associate with other living beings in order to form social attachments. The associations developed in a social context serve to support, guide, and protect the individuals involved. Studies indicated that the need or urge for affiliation is especially intense when an individual is undergoing an anxiety-producing experience. There is also evidence that the expression of this drive differs greatly from individual to individual, with a large portion of this difference dependent on early experience. The affiliative drive serves as a defense mechanism to protect individuals through the principle of "strength in numbers."

Paraphrase:


1
The affiliative drive is the urge or need to associate with others for support, guidance, and
2
protection. This drive, which varies from individual
3
to individual, is especially strong when a person
4
is experiencing anxiety.

00056

Affiliative drive is the urge or need to associate with other living beings in order to form social attachments. The associations developed in a social context serve to support, guide, and protect the individuals involved. Studies indicated that the need or urge for affiliation is especially intense when an individual is undergoing an anxiety-producing experience. There is also evidence that the expression of this drive differs greatly from individual to individual, with a large portion of this difference dependent on early experience. The affiliative drive serves as a defense mechanism to protect individuals through the principle of "strength in numbers."

Paraphrase:

The affiliative drive is the urge or need to associate with others for support, guidance, and protection. This drive, which varies from individual to individual, is especially strong when a person is experiencing anxiety.

00057

Cancer is still an unsolved problem. Its incidence has increased in proportion to the aging of the population. Although many early cases can be cured through surgical operations, X-ray, and radium, yet a large-scale attack is impossible unless its cause and pathogenesis are known. Biochemistry may solve this problem also, unless we are faced with a biological principle that still escapes us. It is extremely difficult to understand the biology of the cancer cell because it reacts differently from all other cells. In a differentiated organism the cells form a social community. They are specialized and cooperate in a perfect way. The cancer cell is asocial. It goes its own way, has its own metabolism, thrives at the expense of the organism like a parasite, destroys it and in so doing destroys itself. This is against all rules and therefore is difficult to conceive.

Paraphrase:

Even though some early cases of cancer can be cured through surgery, X-ray, and radium, a large-scale attack is not yet possible because it is extremely difficult to understand the biology of the cancer cell. Unlike cells in a differentiated organism which form a social community, specializing and cooperating perfectly, the cancer cell is asocial and breaks all the rules. The cancer cell goes its own way, has its own metabolism, is parasitic and destroys both the organism and itself.

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Paraphrase:

Even though some early cases of cancer can be cured through surgery, X-ray and radium, a large-scale attack is not yet possible because it is extremely difficult to understand the biology of the cancer cell. Unlike cells in a differentiated organism which form a social community, specializing and cooperating perfectly, the cancer cell is asocial and breaks all the rules. The cancer cell goes its own way, has its own metabolism, is parasitic and destroys both the organism and itself.

OC059

Psychologists as well as parents have observed that order of birth in a family often affects the personality of the developing child. There is no biological factor at work; the effects depend on the relations of children with parents and siblings. The first-born usually gets more attention (often more anxious over-protection) than later children and is likely to be more oriented to adults than to children. For a time he has the status of only child and may be upset by the birth of a rival. The youngest child may be pampered because he or she is the baby of the family. Second or middle children may feel left out, as having the status of neither eldest nor "baby." On the other hand, they may have a warmer relation with the mother than a first-born because the mother is less anxious and tense. Obviously, the parents' behavior toward their children can make the birth-order problem anything from minor to traumatic.

Paraphrase:

Depending on the parents' behavior, birth order may strongly affect the personality of the child. First (1) borns usually get more attention, are more adult oriented, (2) and are likely to be upset by the birth of a rival. The (3) youngest child may be pampered and middle children may (4) feel left out. However, these later borns may have a warmer relationship with their mother than a first born.

00060

Psychologists as well as parents have observed that order of birth in a family often affects the personality of the developing child. There is no biological factor at work; the effects depend on the relations of children with parents and siblings. The first-born usually gets more attention (often more anxious over-protection) than later children and is likely to be more oriented to adults than to children. For a time he has the status of only child and may be upset by the birth of a rival. The youngest child may be pampered because he or she is the baby of the family. Second or middle children may feel left out, as having the status of neither eldest nor "baby." On the other hand, they may have a warmer relation with the mother than a first-born because the mother is less anxious and tense. Obviously, the parents' behavior toward their children can make the birth-order problem anything from minor to traumatic.

Paraphrase:

Depending on the parents' behavior, birth order may strongly affect the personality of the child. First borns usually get more attention, are more adult oriented, and are likely to be upset by the birth of a rival. The youngest child may be pampered and middle children may feel left out. However, these later borns may have a warmer relationship with their mother than a first born.

00061

Step-by-Step Construction of Paraphrases

We will now give you three paragraphs, two of which you have already seen in the first section, and we will show you, in a step-by-step fashion, how the paraphrases have been constructed. You will notice that in formulating a paraphrase we first choose the main idea of the paragraph and then add the specific facts that have been presented. The underlining indicates which portion of the paragraph has been included in a particular version of the paraphrase. In this part of the pre-training you are to closely observe how these paraphrases were constructed because in the next series of exercises you will be asked to construct your own.

You will have three (3) minutes to go through the three paragraphs. When you reach the next set of instructions please stop.

00062

Affiliative drive is the urge or need to associate with other living beings in order to form social attachments. The associations developed in a social context serve to support, guide, and protect the individuals involved. Studies indicated that the need or urge for affiliation is especially intense when an individual is undergoing an anxiety-producing experience. There is also evidence that the expression of this drive differs greatly from individual to individual, with a large portion of this difference dependent on early experience. The affiliative drive serves as a defense mechanism to protect individuals through the the principle of "strength in numbers."

Paraphrase:

The affiliative drive is the urge or need to associate with other...

FIRST STAGE

Affiliative drive is the urge or need to associate with other living beings in order to form social attachments. The associations developed in a social context serve to support, guide, and protect the individuals involved. Studies indicated that the need or urge for affiliation is especially intense when an individual is undergoing an anxiety-producing experience. There is also evidence that the expression of this drive differs greatly from individual to individual, with a large portion of this difference dependent on early experience. The affiliative drive serves as a defense mechanism to protect individuals through the principle of "strength in numbers."

Paraphrase:

The affiliative drive is the urge or need to associate with others for support, guidance, and protection.

SECOND STAGE

00064

Affiliative drive is the urge or need to associate with other living beings in order to form social attachments. The associations developed in a social context serve to support, guide, and protect the individuals involved. Studies indicated that the need or urge for affiliation is especially intense when an individual is undergoing an anxiety-producing experience. There is also evidence that the expression of this drive differs greatly from individual to individual , with a large portion of this difference dependent on early experience. The affiliative drive serves as a defense mechanism to protect individuals through the principle of "strength in numbers."

Paraphrase:

The affiliative drive is the urge or need to associate with others for support, guidance, and protection. This drive,..., is especially strong when a person is experiencing anxiety.

THIRD STAGE

Affiliative drive is the urge or need to associate with other living beings in order to form social attachments. The associations developed in a social context serve to support, guide, and protect the individuals involved. Studies indicated that the need or urge for affiliation is especially intense when an individual is undergoing an anxiety-producing experience. There is also evidence that the expression of this drive differs greatly from individual to individual , with a large portion of this difference dependent on early experience. The affiliative drive serves as a defense mechanism to protect individuals through the principle of "strength in numbers."

Paraphrase:

The affiliative drive is the urge or need to associate with others for support, guidance, and protection. This drive, which varies from individual to individual, is especially strong when a person is experiencing anxiety.

FINAL PRODUCT

Cancer is still an unsolved problem. Its incidence has increased in proportion to the aging of the population. Although many early cases can be cured through surgical operations, X ray, and radium, yet a largescale attack is impossible unless its cause and pathogenesis are known. Biochemistry may solve this problem also, unless we are faced with a biological principle that still escapes us. It is extremely difficult to understand the biology of the cancer cell because it reacts differently from all other cells. In a differentiated organism the cells form a social community. They are specialzed and cooperate in a perfect way. The cancer cell is asocial. It goes its own way, has its own metabolism, thrives at the expense of the organism like a parasite, destroys it and in so doing destroys itself. This is against all rules and therefore is difficult to conceive.

Paraphrase:

...it is extremely difficult to understand the biology of the cancer cell. Unlike cells in a differentiated organism which form a social community, specializing and cooperating, the cancer cell is asocial...

FIRST STAGE

00067

Cancer is still an unsolved problem. Its incidence has increased in proportion to the aging of the population. Although many early cases can be cured through surgical operations, X ray, and radium, yet a largescale attack is impossible unless its cause and pathogenesis are known. Biochemistry may solve this problem also, unless we are faced with a biological principle that still escapes us. It is extremely difficult to understand the biology of the cancer cell because it reacts differently from all other cells. In a differentiated organism the cells form a social community. They are specialized and cooperate in a perfect way. The cancer cell is asocial. It goes its own way, has its own metabolism, thrives at the expense of the organism like a parasite, destroys it and in so doing destroys itself. This is against all rules and therefore is difficult to conceive.

Paraphrase:

...it is extremely difficult to understand the biology of the cancer cell. Unlike cells in a differentiated organism which form a social community, specializing and cooperating, the cancer cell is asocial and breaks all the rules. The cancer cell goes its own way, has its own metabolism, is parasitic, and destroys both the organism and itself.

SECOND STAGE

Cancer is still an unsolved problem. Its incidence has increased in proportion to the aging of the population. Although many early cases can be cured through surgical operations, X ray, and radium, yet a largescale attack is impossible unless its cause and pathogenesis are known. Biochemistry may solve this problem also, unless we are faced with a biological principle that still escapes us. It is extremely difficult to understand the biology of the cancer cell because it reacts differently from all other cells. In a differentiated organism the cells form a social community. They are specialized and cooperate in a perfect way. The cancer cell is asocial. It goes its own way, has its own metabolism, thrives at the expense of the organism like a parasite, destroys it and in so doing destroys itself. This is against all rules and therefore is difficult to conceive.

Paraphrase:

Even though some early cases of cancer can be cured through surgery, X-ray and radium, a large-scale attack is not yet possible because it is extremely difficult to understand the biology of the cancer cell. Unlike cells in a differentiated organism which form a social community, specializing and cooperating perfectly, the cancer cell is asocial and breaks all the rules. The cancer cell goes its own way, has its own metabolism, is parasitic and destroys both the organism and itself.

FINAL PRODUCT

00069

The earliest "psychiatry" of which we have any knowledge was that practiced by stone age cave men some half million years ago. For certain forms of mental illness probably those where the patient complained of severe headaches and developed convulsive attacks, the early medicine man treated the disorder by means of an operation called trephining in which one area of the skull was chipped away in the form of a circle until the skull was chipped through. This opening called a trephine, presumably permitted the evil spirit which was causing all the trouble to escape, and incidentally may have relieved a certain amount of pressure on the brain. In some cases trephined skulls of primitive men show healing around the opening, indicating that the individual survived the operation and lived for many years afterward.

Paraphrase:

The earliest "psychiatry" occurred a half a million years ago when cavemen suffering from mental illness marked by severe headaches and convulsive attacks were given an operation called trephining...

FIRST STAGE

The earliest "psychiatry" of which we have any knowledge was that practiced by stone age cave man some half million years ago. For certain forms of mental illness probably those where the patient complained of severe headaches and developed convulsive attacks, the early medicine man treated the disorder by means of an operation called trephining in which one area of the skull was chipped away in the form of a circle until the skull was chipped through. This opening called a trephine, presumably permitted the evil spirit which was causing all the trouble to escape, and incidentally may have relieved a certain amount of pressure on the brain. In some cases trephined skulls of primitive men show healing around the opening, indicating that the individual survived the operation and lived for many years afterward.

Paraphrase:

The earliest "psychiatry" occurred a half a million years ago when cavemen suffering from mental illness marked by severe headaches and convulsive attacks were given an operation called trephining in which their skulls were chipped through in the form of a circle.

SECOND STAGE

00071

The earliest "psychiatry" of which we have any knowledge was that practiced by stone age cave man some half million years ago. For certain forms of mental illness, probably those where the patient complained of severe headaches and developed convulsive attacks, the early medicine man treated the disorder by means of an operation called trephining in which one area of the skull was chipped away in the form of a circle until the skull was chipped through. This opening, called a trephine, presumably permitted the evil spirit which was causing all the trouble to escape, and incidentally may have relieved a certain amount of pressure on the brain. In some cases trephined skulls of primitive men show healing around the opening, indicating that the individual survived the operation and lived for many years afterward.

Paraphrase:

The earliest "psychiatry" occurred a half a million years ago when cavemen suffering from mental illness marked by severe headaches and convulsive attacks were given an operation called trephining in which their skulls were chipped through in the form of a circle. The opening in the skull, called a trephine, was believed to permit evil spirits to escape. Actually it may have relieved some of the pressure on the brain.

THIRD STAGE

The earliest "psychiatry" of which we have any knowledge was that practiced by stone age cave man some half million years ago. For certain forms of mental illness probably those where the patient complained of severe headaches and developed convulsive attacks, the early medicine man treated the disorder by means of an operation called trephining in which one area of the skull was chipped away in the form of a circle until the skull was chipped through. This opening called a trephine, presumably permitted the evil spirit which was causing all the trouble to escape, and incidentally may have relieved a certain amount of pressure on the brain. In some cases trephined skulls of primitive men show healing around the opening, indicating that the individual survived the operation and lived for many years afterward.

Paraphrase:

The earliest "psychiatry" occurred a half a million years ago when cavemen suffering from mental illness marked by severe headaches and convulsive attacks were given an operation called trephining in which their skulls were chipped through in the form of a circle. The opening in the skull, called a trephine, was believed to permit evil spirits to escape. Actually it may have relieved some of the pressure on the brain. Healed skulls of trephined persons have been found indicating that some patients survived the operation and lived many years afterwards.

FINAL PRODUCT

00073

Paraphrase Connections to Single Paragraphs

Now that you have had experience with some of our paraphrases we are going to give you a chance to construct your own. On the first page of this exercise there is a paragraph with a blank space beneath it. You are to read the paragraph and in the blank space write the paraphrase that you have formed. Then, when you are satisfied with your paraphrase turn both the page you are on and the following blank page and you will find the same paragraph with a paraphrase that we have constructed. Our paraphrase is to give you an idea of how a paraphrase could have been formed. It may help if you were having a hard time thinking of a paraphrase that captured all the main ideas. But remember, the paraphrase we provide is just a suggestion. It is certainly not the only way to form a paraphrase. In fact, in many cases your paraphrase will probably be much better than ours.

Remember, the more bizarre, unique, or unusual you can make your paraphrase the more memorable it will be. Our paraphrase was made in a standard fashion without an effort to create anything unusual, so your job is to make your paraphrase at least more unique than ours.

Are there any questions?

You will now construct paraphrases and receive feedback on four paragraphs after which we will stop and see if there are any questions. You will be given five (5) minutes to do these four exercises. Please do not hurry; it is not necessary for you to complete all four. If you do finish early, please go back and check over your work. Do not go further into the booklet.

00024

The mountain Arapesh are poor people whose tiny villages cling to the sides of barren mountains. Their gardens perch on hillsides, difficult to fence off from the wild pigs.

Paraphrase:

Arapesh have gardens on steep hillsides, making it hard to fence the gardens off from the wild pigs.

00075

Americans and Spaniards at a bullfight provide a familiar example of how the same set of circumstances can be experienced differently. The American experiences the fear he would have if he were in the ring; the Spaniard, vicariously, the joy in the control the matador exercises over the bull.

Paraphrase:

A bullfight can produce fear in an American and joy in a Spaniard, thus showing that the same set of circumstances can be experienced differently.

00076

Synesthesia is a regular linking of the perception of a certain sensation with images from another sensory modality, producing a subjective sensation of a sense other than the one being stimulated. The most common form is "colored hearing" (chromesthesia), where certain sounds evoke images of colors.

Paraphrase:

Synesthesia occurs when the stimulation of one sense produces the subjective experience of another sense, as when sounds evoke images of colors.

00077

To understand the behavior of an individual, the psychologist must have some understanding of the effect of the society in which the individual lives and was reared. Since so much of a person's behavior is determined by his relation to his society, we can understand him as an individual only if we understand how his behavior fits the expectations of his society and know when his behavior is deviating from such expectations.

Paraphrase:

Since society plays a large part in determining what is expected of an individual it is necessary to understand an individual's relationship to society in order to understand his behavior.

00078

Further Instructions

O.K.! If there are no further questions you will now go through the next four paragraphs in the same way. Again you will be given five (5) minutes to do this. If you finish early you may go back and check your work. Please remember that you do not need to hurry.

00079

By the process of ionization, electrons can be removed from the influence of the parent atom. These electrons, once removed from the atom, are capable of moving through the material under the influence of external forces. It is by virtue of the movement of these electrons that electrical energy is transported from place to place.

Paraphrase:

Electrical energy is transported by external forces moving electrons which have been removed from their parent atom by the process of ionization.

00080

Emotional disorders are commoner in bedwetters (enuretics) than in nonbedwetters, but most children who are enuretic are psychiatrically normal. The relationship between emotional disturbance and enuresis holds true at all ages and is stronger for girl enuretics and for children who wet both at night and during the day.

Paraphrase:

Bedwetters, especially girls and day and night wetters, are more likely to have emotional disturbances than non-bedwetters even though most of them are psychiatrically normal.

00081

One dramatic aspect of behavior modification is its ability to change a person's conduct without his awareness that a change is taking place. A case in point concerns a psychologists and seventeen students. The students were told to reinforce any statement made to them by friends and relatives that began with an expression of personal conviction: "I think," "I believe," "It seems to me," or "I feel." They did this by smiling or paraphrasing the statement in an agreeable fashion. In every case, the friend or relative increased the rate at which he stated personal convictions. In no case were the friends or relatives aware that they were being conditioned.

Paraphrase:

Behavior modification can be used to change a person's behavior without his awareness that a change is taking place. For example, members of a psychology class, using smiling and agreement as reinforcers, were able to change the rate at which friends stated personal convictions such as "I believe." This was done without the friends being aware that modification was occurring.

00082

It has long been recognized that the group can be an awesomely powerful force for changing individual behavior. The problem is that, up until recently, group power has not been harnessed in the service of man. One possible reason for this scientific boycott is the widely held belief that groups act as a toxin to the human spirit, that their power is most often used to manipulate a person's actions in a manner antithetical to social values and personal dignity. The view of a group as a force for supporting antisocial acts is subscribed to by many scientists and laymen alike. Currently, for example, we are hearing much about the way teen-age groups (read "gangs") force youth into drugs, crime, and disrespect for their elders.

Paraphrase:

Teenage gangs forcing youths into drugs, crime and disrespect for their elders is an example of the way that both scientists and laymen view the destructive force of a group. While it is recognized that the group can be a powerful force for changing individual behavior, belief in its destructive nature has prohibited its use for the good of man until recently.

Instructions on Forming Memorable Paraphrases

Up to this point we have been telling you to create bizarre, unusual, and unique paraphrases, but we have not told you how. In this section of your training we will attempt to give you some ideas on how to make your paraphrases more unusual and therefore more memorable. We realize that some of the things you are about to encounter will appear gimmicky. You may wonder if learning by such techniques will merely clutter your mind with trivia. In fact, you may wonder if such learning is even "fair."

Well, there are a few points to be remembered. First, the paraphrase technique is not a substitute for understanding the material; it is a way of supplementing or enhancing your memory. However, by using the technique, especially in forming unusual paraphrases, you are forcing yourself to thoroughly understand the material even before the paraphrase is completed. Second, as pointed out in retrieval training, incidental cues or connections are often used during recall. Actively forming unusual paraphrases merely makes you conscious of some of these connections while you are storing the material. Third, creating bizarre paraphrases can often make the learning of otherwise dull material fun. In fact, because it is an active process and because it is often fun, the paraphrase connection technique can dramatically increase your ability to concentrate.

Let's now get on with the main business of making your paraphrases more memorable. The following are suggestions which can be used individually or in combination to make a paraphrase more unique.

(1) Personalize your paraphrase by naming characters after friends and relatives and by naming locations after places that are familiar to you. In fact, you can even attempt to cast your friends and relatives into roles for which they would be best suited. For a passage on sleep, your lazy brother-in-law, Harold, would be perfect as the main character.

(2) Make the characters, objects and situations in your paraphrase as absurd as possible. For example, give your characters grotesque or unusual attributes: purple faces, mammoth eyes, long necks, strange clothes, weird hairstyles, etc. If possible, the strange attributes should relate to ideas presented in the passage. For a passage that deals with how humans hear, a person with giant ears flapping in the breeze would obviously be an appropriate character.

(3) Use puns as a basis for forming paraphrases. Puns involve finding an alternative and usually funny meaning for a word or set of words used in the passage. If the passage is about writing skills there may be a place in your paraphrase for a teacher encouraging his students by yelling "Write On!"

(4) Substitute animal characters for human characters and vice versa. A mean old man may be represented in your paraphrase by a gray-haired bulldog with a cane. A giraffe may be represented by Kareem Abdul Jabbar.

(5) Push your paraphrase into the past or the future. If the passage is about divorce, describe cavemen and women in divorce courts arguing over custody of the cave. If the passage is about schools describe spacemen floating in their desks being taught by a seven-headed professor.

(6) Put famous characters in your paraphrase. If the passage is about raising little girls, a miniature Raquel Welch might be a nice addition to your cast of characters.

(7) Use rhymes in your paraphrase.

"Roses are red, Violets are blue;
I like electrons, Protons do too" might be

an absurd way to remember some parts of a passage on atomic physics.

(8) Add smell, feel, and taste to your paraphrases. If the passage is about elephants, describing their smell would bring on a certain amount of authenticity.

(9) Other approaches: Use four letter words, joke punch lines, and movie plots.

Although there are many additional ways of making your paraphrase unusual, you have probably gotten the idea by now. The general approach is to create a standard paraphrase and then add to it in order to make it unique and, therefore, more memorable. To give you a bit more familiarity with this procedure we would like you to look through the following material. In each case there is a passage followed by two paraphrases increasing in uniqueness. Following the last paraphrase will be a brief description of what we tried to do to make this paraphrase unique. You will now have 4 minutes to go through three of these passages and their associated paraphrases. Please observe these paraphrases closely for in the next exercise you will be asked to create your own unusual paraphrases. Please stop when you get to the next set of instructions.

Any Questions!

00086

Some children can be described as "addicted" to school achievement. Academic failure would be perceived by them as catastrophic, so that they must continually strive for academic excellence in order to avoid the possibility of pain.

Paraphrase:

Some children strive to make high grades in order to avoid the intense pain of failure.

00087

Some children can be described as "addicted" to school achievement. Academic failure would be perceived by them as catastrophic, so that they must continually strive for academic excellence in order to avoid the possibility of pain.

Paraphrase:

For some, the road to school success is lined with advertisements like the following:

"Study all day,
Or you'll have to pay,
In pain and heartache,
All the way,
BURMA SHAVE!"

A Slightly More Unique Connection

00088

Development of the Second Connection

The content of the paragraph was captured in a rhyme. The idea was from an old advertising gimmick for Burma Shave so we included the company name to help us remember the material even better.

00083

Although many substances are composed of a single element, a far greater number of substances are composed of a combination of different elements. When two or more elements are chemically combined, they form COMPOUNDS. A common example of a compound would be a substance such as water, which is composed of the element hydrogen and the element oxygen. As elements such as hydrogen and oxygen are chemically combined to form a compound, they lose their individual identity.

Paraphrase:

When elements are chemically combined they lose their individual identity as elements and become compounds. An example of this is when hydrogen and oxygen combine to form the compound water.

00090

Although many substances are composed of a single element, a far greater number of substances are composed of a combination of different elements. When two or more elements are chemically combined, they form COMPOUNDS. A common example of a compound would be a substance such as water, which is composed of the element hydrogen and the element oxygen. As elements such as hydrogen and oxygen are chemically combined to form a compound, they lose their individual identity.

Paraphrase:

As an example let's take an elementary case from the files of the C.I.A. (Chemical Investigators of Atoms). Although he couldn't see them, Sherlock Holmes concluded that Harry Hydrogen and Orville Oxygen were living in a beaker of water. Apparently they compounded their problems by getting together and dropping out of sight.

A Slightly More Unusual Connection

00091

Further Instructions

O.K.! If there are no further questions you will now go through the next four paragraphs in the same way. Again you will be given five (5) minutes to do this. If you finish early you may go back and check your work. Please remember that you do not need to hurry.

00092

Psychologists as well as parents have observed that order of birth in a family often affects the personality of the developing child. There is no biological factor at work; the effects depend on the relations of the children with parents and siblings. The first-born usually gets more attention (often more anxious over-protection) than later children and is likely to be more oriented to adults than to children. For a time he has the status of only child and may be upset by the birth of a rival. The youngest child may be pampered because he or she is the baby of the family. Second or middle children may feel left out, as having the status of neither eldest nor "baby." On the other hand, they may have a warmer relations with the mother than a first-born because the mother is less anxious and tense. Obviously, the parents' behavior toward their children can make the birth-order problem anything from minor to traumatic.

Paraphrase:

Depending on the parents' behavior, birth order may strongly affect the personality of the child. First borns usually get more attention, are more adult oriented, and are likely to be upset by the birth of a rival. The youngest child may be pampered and middle children may feel left out. However, these later borns may have a warmer relationship with their mother than a first born.

00093

Psychologists as well as parents have observed that order of birth in a family often affects the personality of the developing child. There is no biological factor at work; the effects depend on the relations of the children with parents and siblings. The first-born usually gets more attention (often more anxious over-protection) than later children and is likely to be more oriented to adults than to children. For a time he has the status of only child and may be upset by the birth of a rival. The youngest child may be pampered because he or she is the baby of the family. Second or middle children may feel left out, as having the status of neither eldest nor "baby." On the other hand, they may have a warmer relation with the mother than a first-born because the mother is less anxious and tense. Obviously, the parents' behavior toward their children can make the birth-order problem anything from minor to traumatic.

Paraphrase:

Let's think of birth order in the same way we might think of ordering food in the "Family Planning Restaurant." Our order might go like this: "Waitress, for my first course I would like a child that needs a lot of attention and who is upset by new-comers, follow that with one who feels left out, and for dessert I'll take one who is pampered and spoiled."

A Slightly More Unusual Connection

Development of the Second Connection

This connection was made somewhat unique by developing a pun on the word order. In this case birth order was considered to be analogous to a food order in a restaurant. The personalities of the children were reflected in the description of the three course meal.

00095

Further Instructions on Memorable Paraphrases

Now that you have had experience with some of our paraphrases we are going to give you a chance to construct your own. On the first page of the next exercise will be a paragraph with a blank space beneath it. You are to write an appropriate paraphrase beneath the paragraph. This paraphrase should be as unusual and memorable as you can make it. After you have finished with your paraphrase you can turn the page and compare yours with ours. For the first few paragraphs we have continued to construct two paraphrases for each paragraph: a standard paraphrase and a unique paraphrase. Please examine both of these paraphrases in order to see how they were constructed. For most of the paragraphs we have created only a standard paraphrase. On these paragraphs your job is to come up with a paraphrase that is more unusual than ours.

You will now be given 15 minutes to go through the paragraphs contained in the remainder of the booklet. If you finish early, please go back and check your work. Remember, you do not have to finish all of the paragraphs. It is better to do a few carefully than to hurry through a large number of them.

00036

The earliest "psychiatry" of which we have any knowledge was that practiced by stone age cave man some half million years ago. For certain forms of mental illness probably those where the patient complained of severe headaches and developed convulsive attacks, the early medicine man treated the disorder by means of an operation called trephining in which one area of the skull was chipped away in the form of a circle until the skull was chipped through. This opening called a trephine, presumably permitted the evil spirit which was causing all the trouble to escape, and incidentally may have relieved a certain amount of pressure on the brain. In some cases trephined skulls of primitive men show healing around the opening, indicating that the individual survived the operation and lived for many years afterward.

Paraphrase:

The earliest "psychiatry" occurred a half a million years ago when cavemen suffering from mental illness marked by severe headaches and convulsive attacks were given an operation called trephining in which their skulls were chipped through in the form of a circle. The opening in the skull, called a trephine, was believed to permit evil spirits to escape. Actually it may have relieved some of the pressure on the brain. Healed skulls of trephined persons have been found indicating that some patients survived the operation and lived many years afterwards.

The earliest "psychiatry" of which we have any knowledge was that practiced by stone age cave man some half million years ago. For certain forms of mental illness probably those where the patient complained of severe headaches and developed convulsive attacks, the early medicine man treated the disorder by means of an operation called trephining in which one area of the skull was chipped away in the form of a circle until the skull was chipped through. This opening called a trephine, presumably permitted the evil spirit which was causing all the trouble to escape, and incidentally may have relieved a certain amount of pressure on the brain. In some cases trephined skulls of primitive men show healing around the opening, indicating that the individual survived the operation and lived for many years afterward.

Paraphrase:

Like modern day doctors, early psychiatrist were avid golfers. The only difference is that they practiced their chip shots on their patients' heads and called it trephining. This particular shot, which usually removed a small divot, was claimed to release the evil spirits that were causing the headaches and convulsions. Skulls have been found that indicate some patients survived and that attest to this ancient practice of skullduggery. Doctors today think that trephining may have actually relieved some pressure on the brain.

A Slightly More Unusual Connection

00098

Since trout often live in clear lakes and streams care must be taken to remain unseen. The best fishermen often crawl on their bellies to the edge of the stream or cast from behind a screen of bushes.

Paraphrase:

In order to not be seen by trout living in clear water, the best fishermen either crawl to the edge of the stream or cast from behind bushes.

00099

Since trout often live in clear lakes and streams, care must be taken to remain unseen. The best fishermen often crawl on their bellies to the edge of the streams or cast from behind a screen of bushes.

Paraphrase:

The best fishermen must be good bushwackers and belly creeps to avoid being seen by trout in clear streams.

A Slightly More Unusual Connection

00100

Gulls look remarkably alike. Differences in appearance among the large gulls of the genus Larus can be subtle: a slight variation in size or a change in the color of the wing tips or the eye and the small fleshy ring around the eye. Observing differences of this kind, an ornithologists discriminates among species of the genus. The gulls themselves, are equally discriminating. In some places Larus species that seem virtually indistinguishable nest side by side, yet do not interbreed.

Paraphrase:

Even though gulls look remarkable alike ornithologists discriminate between species by noting the slight variations in size and the color of the wing tip, eyes, and the small fleshy ring around the eye. Gulls are equally able to discriminate between species and even in areas where gulls of different species nest side by side they never interbreed with each other.

00101

Gulls look remarkable alike. Differences in appearance among the large gulls of the genus Larus can be subtle: a slight variation in size or a change in the color of the wing tips or the eye and the small fleshy ring around the eye. Observing differences of this kind, an ornithologist discriminates among species of the genus. The gulls themselves, are equally discriminating. In some places Larus species that seem virtually indistinguishable nest side by side, yet do not interbreed.

Paraphrase:

Ornithologists and gulls both practice gull discrimination. In fact the following statement was made yesterday by George Gull: "Some of best friends have large fleshy eye rings and funny colored wing tips, but I wouldn't want my sister to marry one. However, they can nest next door if they want."

A Slightly More Unusual Connection

00102

Tennis ball serving machines have been refined to the point where they can vary spin, speed and direction in enough combinations to reduce willing learners to confusion or exhaustion.

Paraphrase:

New tennis ball machines can reduce learners to confusion or exhaustion by varying spin, speed, and direction.

00103

Tennis ball serving machines have been refined to the point where they can vary spin, speed and direction in enough combinations to reduce willing learners to confusion or exhaustion.

Paraphrase:

After playing with a tennis ball serving machine, Bobby Riggs made the following comment: "What spin, speed and varied direction -- I'd rather play Billy Jean King."

A Slightly More Unusual Connection

We are surrounded by the technological successes of science: space vehicles, nuclear power, new synthetic chemicals, medical advances that increase the length and usefulness of human life. But we also see some sharp contrasts. We hear of masterful schemes for using nuclear explosions to extract pure water from the moon; but in some American cities the water that flows from the tap is undrinkable and the householder must buy drinking water in bottles. Science is triumphant with far ranging success, but its triumph is somehow clouded by growing difficulties in providing for the simple necessities of human life on the earth.

Paraphrase:

While science's technological successes are great: space vehicles, nuclear power, synthetic chemicals and medical advances, we still don't seem to be able to provide for the simple necessities of human life on earth. An example of this contrast is the scheme to extract pure water from the moon using nuclear explosions while the water on earth is undrinkable in some American cities.

If you walked into Dr. David Shapiro's laboratory at the Harvard Medical School and looked around, you might think you were witnessing a patient's physical examination. After all, the young man seated nearby is obviously having his blood pressure checked; the inflatable cuff is already wrapped snugly around his upper arm. If, however, you lingered in the room awhile, you'd soon realize that this examination is like no other you have ever seen. Who ever heard of a patient having his blood pressure tested twenty-five times in one sitting, and this to the accompaniment of flashing red lights, strange tones, and even an occasional slide of a Playboy nude? Better yet, who ever heard of a patient's blood pressure going down under such conditions? Yet that is exactly what happened when Dr. Shapiro and his colleagues asked a group of young men to lower their blood pressure using biofeedback. How did they do it? To answer this, you first have to know what biofeedback is.

Paraphrase:

In Dr. Shapiro's lab at Harvard young men are having their blood pressure taken while lights are flashing, Playboy pictures are shown and strange tones are sounding. What's surprising is that their blood pressure is going down. This is because Dr. Shapiro has his group using biofeedback.

A whale's flipper, a bat's wing, and a man's arm are as different from one another in outward appearance as they are in the function they serve, But the bones of these structures reveal an essential similarity of design. The zoologist concludes that whale, bat and man evolved from a common ancestor. Even if there were no other evidence, the comparison of the skeletons of these creatures would suffice to establish that conclusion, The similarity of skeletons shows that a basic structure may persist over geologic periods in spite of a wide divergence of function.

Paraphrase:

The bones of a whale's flipper, a bat's wing, and a man's arm are very similar in design, thereby leading zoologists to conclude that the above animals evolved from a common ancestor.

Instinct can equip an animal with a series of adaptive responses which appear ready-made at their first performance. This is clearly advantageous for animals with short lifespans and little or no parental care. The arthropods, for example, show a remarkable development of instinct for no other course is open to them. A female digger-wasp emerges from her underground pupa in spring. Her parents died the previous summer. She has to mate with a male wasp and then perform a whole series of complex patterns connected with digging out a nest hole, constructing cells within it, hunting and killing prey such as caterpillars, provisioning the cells with the prey, laying eggs and finally sealing up the cells. All this must be completed within a few weeks, after which the wasp dies. It is quite inconceivable that she could achieve this tight schedule if she had to learn everything from scratch and by trial and error.

Paraphrase:

Due to their short life spans and lack of parental care many animals have a set of inborn adaptive responses or instincts which do not require learning. An example is the digger-wasp who must: mate with a male wasp, construct nest cells, kill insects to put in these cells, lay eggs, and seal up the cells all within the few weeks the wasp has to live.

00108

Instructions for Forming Cumulative Paraphrases

In the last training session you gained some experience in creating memorable paraphrases to single, independent paragraphs. With most academic material, however, information is presented in multiple, related paragraphs. In such cases, it would seem reasonable to create paraphrases that included more and more of the material being presented. In this section of the program we will give you information and experience in expanding your paraphrases to include material presented in previous paragraphs. In essence we want you to form cumulative paraphrases, paraphrases that accumulate information as you proceed from paragraph to paragraph.

First it is necessary to give you a more specific idea of what we mean by cumulative paraphrases. In the following examples pairs of related paragraphs are presented with their associated paraphrases. As you will notice, the paraphrases to the second paragraph of a pair includes information from the first. Because of the new connections formed, putting paraphrases together in this way should make the information easier to remember.

For the next 4 minutes we would like you to look through the following 4 pairs of related paragraphs and their associated paraphrases. Please pay close attention to how these paraphrases have been created since you will be producing your own cumulative paraphrases in the next training exercise.

Any Questions!

00109

Asthenic reaction is a psychoneurotic syndrome marked by chronic tiredness. The asthenic person finds it hard to concentrate and lacks the energy to complete mental or physical work. He may say that he needs extra sleep, but he wakes up feeling worse than when he went to bed. He often complains of headache, indigestion, or other bodily ailments. He tends to be listless and unable to cope with routine problems, though he may occasionally "wake up" and enjoy a card game or other specially interesting activity.

Paraphrase:

An asthenic reaction is a syndrome characterized by chronic tiredness. The asthenic person is always tired, no matter how much sleep he gets, finds it hard to concentrate, complains about bodily ailments, and seems unable to complete even the most routine task. Only occasionally will an especially interesting activity catch his attention and "wake him up." Was Rip Van Winkle suffering from an asthenic reaction?

00110

At one time the condition was labeled neurasthenia (literally, "nerve weakness") and was attributed to exhaustion of the nerves from prolonged overwork. The treatment of choice was rest and relaxation. Psychologists now believe that the problem is not fatigue from too much work but is a reaction to prolonged stress and frustration. Temporary feelings of fatigue or listlessness are normal in the face of conflict and stress. But where others get over these problems, the neurotic man or woman makes tiredness a way of life. Neurasthenic symptoms have a certain value in that they serve as an excuse for failure and a means to get attention. Psychotherapy can help the asthenic patient change his pattern.

Paraphrase:

At one time an asthenic reaction which is marked by chronic tiredness, was believed to be caused by overwork and was treated by rest and relaxation. Psychologists now think that such a reaction is due to prolonged stress and frustration. This reaction serves as an excuse for failure and as an attention getting device. Psychotherapy rather than rest and relaxation is now used to change the person's behavior. Was Rip Van Winkle suffering from this reaction?

00111

Determinism is the doctrine that every event has a cause or causes and that these antecedents completely explain the event. In philosophy, this brings up the question of free will: does man have any control over his destiny, or is it shaped by circumstances outside him?

Paraphrase:

Determinism is the doctrine that all events can be completely explained in terms of what has happened before. This raises the question of whether or not man has any control over his destiny. Many people are apparently determined to determine if they have free will.

Without necessarily answering this question, scientific psychology assumes a degree of determinism in behavior. Three categories of determinants are studied, usually as they interact to influence behavior. Biological factors include heredity, bodily constitution, and physiological health and disease. Psychological determinants include emotions, drives, attitudes, conscious and unconscious conflicts and traumas, and learning experiences. Social and cultural factors include economic status, social status, customs and mores, and social conflicts.

Paraphrase:

Scientific psychology believes that behavior can be partially explained in terms of what has happened before. That is, behavior is determined by biological factors, psychological factors, and social and cultural factors.

00113

Displacement is the process by which an emotion originally attached to a particular person, object, or situation is transferred to something else. The unacceptable feelings are usually transferred from an object that is of central importance in the individual's life to an external object that is relatively harmless. A boy who is angry at his parents may kick a dog, or clout a baseball, instead of striking his father. He remains unaware of where his anger was originally focused.

Paraphrase:

Displacement is the unconscious process of transferring unacceptable feelings and actions toward a central figure in the individual's life to a relatively harmless external object. An example of this is a child who is mad at his father but tortures his dog instead.

00114

The displacement of these feelings onto an animal enables him to live comfortably with his father and remains unchanged even after he leaves home and is living independently.

Paraphrase:

Displacement allows the individual to remain on comfortable terms with the original object of his hostility because he has transfered his unacceptable feelings and actions to something else. You can live with your father because you torture your dog.

00115

Dominance relationships are a system of status within a social organization in which individuals occupy different ranks in respect to one another. Such systems, found in both human and animal societies, are sometimes called "pecking orders." The relationships may be based only on physical characteristics, such as strength or cunning, as in the case of most animal social organizations, but in the more complex human societies they usually depend on the acquisition of prestige symbols, such as titles or material possessions.

Paraphrase:

Dominance relationships, also called pecking orders, are the rankings of individuals within a social organization. In animal societies this ranking is usually based on strength or cunning, while in human societies the ranking is usually based on acquired possessions. Top dogs and top seargents can peck at will.

Dominance relationships are usually hierarchical in nature and are subject to change through competitiveness by the members of the society. Psychologists and sociologists believe such an organization of relationships allows the group to remain intact and assures its survival against outside pressures.

Paraphrase:

Dominance relationships or rankings within a social group can be changed by competition between differently ranked individuals. This gives the under dog a chance. These dominance relationships keep the group intact and protect it from outside pressures.

00117

Further Information on Forming Cumulative Paraphrases

Now that you have had some experience with our cumulative paraphrases we would like you to form some of your own. As in the earlier exercise you will read a paragraph, write your unusual paraphrase beneath it, and then turn the next page to see the paraphrase we have created in order to give you some further ideas. In this section pairs of paragraphs will contain related material so that the second paraphrase you form should contain, when possible, the information presented in both paragraphs.

As before, most of our paraphrases are pretty tame so your job is to create paraphrases that are at least more unusual than ours.

You will be given 15 minutes to go through as many of the next 5 pairs of paragraphs that you can. There is no hurry; there is no need to go through all of them. This is just practice. If you should get to the next set of instructions before the time is up, please stop.

ANY QUESTIONS?

00118

Grade AA or Grade A eggs are top quality, with a large amount of firm white, and a well rounded, high standing yolk. While good for all uses, their high quality and freshness are most appreciated for poaching, frying or boiling in the shell.

Paraphrase:

Grade A and AA eggs, which have large, firm whites and high standing yolks, are of the highest quality and are good poached, boiled, fried, or any other way.

00119

Grade B and Grade C eggs have thinner whites, and the yolks tend to flatten out. They are especially useful in omelets, salad dressings, and for combining with foods, as they have the same food value as top grade eggs.

Paraphrase:

Although Grade B and C eggs have thinner whites and flatter yolks they have the same food value as higher grade eggs and are very useful in combination with other foods.

00120

Man's tremendous brain has endowed him with a drive and a capacity for learning which appear to be as strong as the desire for food or sex. This means that when a middle-aged man stops learning he is often left with a great drive and highly developed capacities.

Paraphrase:

Man's drive and capacity for learning appear to be as strong as his drive for food or sex, so when a middle-aged man stops learning he's left with a great drive and highly developed capacities.

00121

If he goes to live in another culture, the learning process is often reactivated. For most Americans tied down at home this is not possible.

Paraphrase:

If a person moves to another culture the learning process is often reactivated, but this is not possible for most Americans.

00122

The varieties of wines are beyond count, not only because every year there is a new tide of all kinds of wines flowing in from all the vineyards of the world, but also because the wines made from the grapes of those same vineyards in previous years change for better or worse with age. There are, however, three main great classes or divisions of wines called Table Wines, Sparkling Wines, and Fortified Wines.

Paraphrase:

Although there are three main divisions of wines, the table wines, sparkling wines and fortified wines; the specific varieties of each are beyond count because of the production of new wines and the ageing of stored wines.

00123

The table wines are the beverage wines, with as little as 8% of alcohol or as much as 13%: they are mostly inexpensive wines with no claim to any attractive bouquet or finesse. The sparkline wines of which champagne is an example owe their effervescence to a carbonic acid gas, while the fortified wines have a much higher alcoholic content than the first two, due to addition of brandy.

Paraphrase:

The three main divisions of wines are table wines which are inexpensive beverage wines with 8 - 13% alcohol content; sparkling wine, such as champagne, which have carbonic acid gas added to produce the effervescent quality, and fortified wines which have the highest alcohol content due to the addition of brandy.

00124

Frozen foods are preserved by quick-freezing. This is done at a very low temperature, and the food must be kept at zero farenheit or below to retain its texture and flavor.

Paraphrase:

Some foods are quickly frozen at a very low temperature and then kept at zero farenheit or below to retain their texture and flavor.

00125

Although foods will freeze at temperatures as high as 32°F., the freezing process is slow and ruins the texture and flavor of the food. In a standard refrigerator, the freezer is mainly useful for storing commercially frozen food, not for home prepared foods.

Paraphrase:

In order to retain texture and flavor, foods should be frozen quickly at temperatures lower than those available in standard refrigerator freezers. Thus such refrigerators are mainly useful for storing food that has been quick-frozen.

00126

The greatest benefit derived from mixing sawdust with the soil is physical, for it contains little nutriments. It loosens heavy soils and makes them easier to work.

Paraphrase:

Sawdust will make the soil looser and easier to work but not more fertile.

00127

Sawdust increases the water holding capacity of all types of soil, because it will absorb up to four times its weight in water. Hence a slightly sandy soil is improved too.

Paraphrase:

Sawdust improves the water holding capacity of all soils.

00128

Instructions on Forming "Shorthand" Paraphrases

Most of the time it would be too time consuming to completely write out your paraphrases. A better procedure would be to form a paraphrase in your head and then write down a few notes to help you remember it. These notes would act like a "shorthand" paraphrase and might ultimately replace underlining and notetaking in your normal studying.

In this section of your training we would like to give you some experience on forming unusual, "shorthand" paraphrases. You will read a paragraph, form a paraphrase in your head, write down a few notes to help you remember the paraphrase, and then turn the next page to see our paraphrase for further ideas. In some of the examples we have provided a shorthand paraphrase as feedback. However, in most cases we have provided a more elaborate version in order to make our ideas clearer. Generally your paraphrases should be simpler than ours.

Some of the paragraphs in this section are related, so in these cases your later "shorthand" paraphrases should contain information from earlier paragraphs. As before, your job is to make your paraphrases more unusual than ours.

You will have 10 minutes to go through the next set of paragraphs. Remember, it is not necessary for you to hurry. Take your time and relax. If you reach the end of the booklet, please stop.

00129

Early in the 1960s a researcher named Stunkard performed a simple but important experiment. He asked a group made up of obese and normal-weight subjects to visit his laboratory at breakfast time. They were given only one previous instruction: Do not eat any food in the early morning hours before the visit to the laboratory. When they arrived, Stunkard had each visitor swallow a gastric balloon that continuously recorded their stomach contractions. Then, at regular fifteen-minute intervals, he asked the subjects, "Do you feel hungry?" They, in turn, answered "yes" or "no," giving Stunkard a measure of how stomach contractions correlate with subjective experiences of hunger. The results for normal subjects were predictable: Their reports of hunger correlated directly with their stomach contractions. "For the obese, on the other hand, there (was) little correspondence between gastric motility and self-reports of hunger." In other words, "whether or not the obese subject (described) himself as hungry seems to have almost nothing to do with the state of his gut."

Paraphrase:

Early in the 1960s, Stunkard had both normal weight and obese individuals swallow a gastric balloon that recorded their stomach contractions. He then asked them every fifteen minutes whether or not they were hungry. The hunger reports for normals correlated directly with their stomach contractions while those for obese people showed very little relationship to their contractions. Apparently, feelings of hunger in an obese person are not related to the state of his stomach.

If the obese person does not experience hunger as a result of stomach contractions, then what does motivate him to eat--and overeat? This question intrigued Columbia University psychologist Stanley Schachter. Through a series of experiments, he came to the following conclusion: "Eating by the obese seems unrelated to any internal visceral state, but is determined by external food-related cues such as the sight, smell, and taste of food." Schachter recognized, of course, that everyone's eating is, to some extent, influenced by his immediate environment. Most tourists, for example, are not hungry for meat after watching a gory bullfight. However, for normal people, situational factors are not dominant; whereas, for the obese, "internal state is irrelevant, and eating behavior is determined largely by external cues."

Paraphrase:

After a series of experiments, a psychologist named Schachter concluded that eating by fat people is determined by external food-related cues such as sight, smell and taste of food instead of the internal visceral state which produces hunger in normals. Although everyone's eating is influenced by the situation to some extent, these situational factors aren't nearly so dominant for normals as they are for obese people.

00131

Although you may not need an engineering degree to operate your array of household appliances, it does help to know this much about electricity: appliances that heat electrically use vastly more electricity than light bulbs, radio and T.V., or electric motors.

Paraphrase:

Appliances that heat electrically use a lot more electricity than light bulbs, radios and T.V., or electric motors.

00132

Your breakfast toaster may use nearly ten times as much current while it's on than the most powerful vacuum cleaners, while your electric iron requires more watts than a dozen light bulbs plus the radio. Air conditioners (heat pumps) are also heavy users of electricity.

Paraphrase:

Appliances which heat electrically such as toasters, irons and air conditioners require many times the amount of electricity of "non-heaters" such as radios, T.V.'s and vacuum cleaners.

00133

Imagine that you are visiting your first English pub and that your host challenges you to a game of darts. Never having played, you graciously decline and then, in the finest American spirit, run out, buy a set, and begin practicing in your hotel. After the first hundred tosses, you begin getting a feel for the game; by the next day, you're ready to go out and challenge the queen's finest.

Paraphrase:

Having been challenged to a game of darts in an English pub, you decline because of lack of experience, you practice for a day, and you are then ready to play.

00134

You have learned your dart game well. But pretend that you were forced to practice your throws blindfolded with plugs in your ears. Could you ever perfect your toss under these conditions? No. Improvement would be impossible because you lacked the vital component of learning: feedback concerning your performance. Deprived of visual feedback, unable to gain knowledge of results concerning your throwing accuracy, your plight would be hopeless.

Paraphrase:

If you practiced your dart game blindfolded you would never improve because you could not see how you were doing (feedback) and you couldn't make corrections.

00135

Deciding When to Use Your Connection Technique

You now have had some experience on forming unusual, cumulative, "shorthand" connections. If practiced, this connection technique should dramatically improve your studying. However, you may have been wondering if the strategy doesn't take too much time. Well, there are two points to be considered here. First, the more you practice the technique, the faster and more automatic it will become. In fact, eventually it will be so automatic that it will not substantially slow down your reading speed. Second, it is not necessary to apply this technique after every paragraph. In this training session we want to help you learn how to decide when to use the technique.

Think about it this way. When you study a textbook, you make some decisions about what part of the text is important enough to demand intensive study. Maybe you also make decisions about how well you understand each passage or section. Certainly, that's what very efficient learners do. They decide how important a passage is, and whether they understand it well enough. Then they put that information together to decide whether they should give it more attention, that is, whether they should apply a connection technique of some sort.

For the purposes of this training program we are going to simplify this decision procedure somewhat. We want you to consider that all of the material that you will be reading is important. That is, consider that all of the material has some chance of appearing on a later test. This is certainly the case in many courses that you will be taking. Now, assuming that everything is important the only judgment you need to make after each paragraph is how well you understood the material. If you understood it very well and could remember it sufficiently to explain it to someone else there would be no reason to use the connection technique. However, if you did not understand it too well or if you thought you would have difficulty remembering it, you should apply the technique of forming unusual, cumulative, "shorthand" connections.

00136

Now, the decision procedure that you should follow is this: read the paragraph, write the rating of your understanding in the blank provided, and if that rating is 6 or less, form an unusual, cumulative, "shorthand" connection to the material presented in the paragraph. If your rating is 7 or more, just proceed on to the next paragraph. If in doubt it is better to form the connection than to skip over the material.

To gain practice on this technique we would like you to go through a Scientific American article that has been broken down into paragraphs. After each paragraph you are to rate your understanding and, depending on your rating, form a "shorthand" connection. You can then turn the next page to see the connection that we have formed. In most cases we have provided you with a standard, total connection. Remember your job is to make a "shorthand" connection that is more unusual than ours and one that is cumulative whenever possible.

Again, the rule is if your rating is 6 or less, you should form a connection. You will be given 15 minutes to go through the next set of paragraphs. Please stop when you get to the next instructions.

Any Questions!

00137

In population growth the human species is conspicuously out of line with the rest of the animal kindgdom. Man is almost alone in showing a longterm upward trend in numbers; most other animals maintain their population size at a fairly constant level. To be sure, many of them fluctuate in number from season to season, from year to year or from decade to decade. Such fluctuations, however, tend to swing erratically around a constant average value. More commonly animal populations maintain a steady state year after year and even century after century. If and when the population does rise or fall permanently, because of some change in the environment, it generally stabilizes again at a new level.

Understanding_____

00138

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Paraphrase:

The human population has continued to increase over a long period of time while almost all other animal populations have fluctuated around a constant average value.

00139

This well-established fact of population dynamics deserves to be studied with close attention, because the growth of human populations has become in recent years a matter of increasing concern. What sort of mechanism is responsible for such strict control of the size of populations? Each animal population, apart from man's, seems to be regulated in a homeostatic manner by some system that tends to keep it within not too wide limits of a set average density. Ecologists have been seeking to discover the nature of this system for many years.

Understanding_____

00140

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Paraphrase:

Because the growth of human population has become a matter of increasing concern, the work of ecologists in determining how other animals homeostatically limit their growth deserves considerable attention.

00141

The prevailing hypothesis has been that population is regulated by a set of negative natural controls. It is assumed that animals will produce young as fast as they efficiently can, and that the main factors that keep population density within fixed limits are predators, starvation, accidents and parasites causing disease. On the face of it this assumption seems entirely reasonable; overcrowding should increase the death toll from most of these factors and thus act to cut back the population when it rises to a high density. On close examination, however, these ideas do not stand up.

Understanding_____

00142

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Paraphrase:

It has been hypothesized that animals produce young as fast as they can and that as overcrowding increases, death from predators, starvation, accidents and disease cut back the population to a lower level. This view of population regulation, however, does not seem to stand up under close examination.

00143

The notions that predators or disease are essential controllers of population density can be dismissed at once. There are animals that effectively have no predators and are not readily subject to disease and yet are limited to a stable level of population. Disease per se does not act on a large scale to control population growth in the animal world. This leaves starvation as the possible control. The question of whether starvation itself acts directly to remove a population surplus calls for careful analysis.

Understanding_____

00144

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Paraphrase:

Predation and disease can be eliminated as the essential controllers of population because there are animals who maintain a stable population and yet have virtually no predators and are not readily susceptible to diseases. This leaves starvation as a possibility for further examination.

00145

Even a casual examination makes it clear that in most animal communities starvation is rare. Normally all the individuals in the habitat get enough food to survive. Occasionally a period of drought or severe cold may starve out a population, but that is an accident of weather--a disaster that does not arise from the density of population. We must therefore conclude that death from hunger is not an important density-dependent factor in coltrolling population size except in certain unusual cases.

Understanding_____

00146

Even a casual examination makes it clear that in most animal communities starvation is rare. Normally all the individuals in the habitat get enough food to survive. Occasionally a period of drought or severe cold may starve out a population, but that is an accident of weather-- a disaster that does not arise from the density of population. We must therefore conclude that death from hunger is not an important density-dependent factor in controlling population size except in certain unusual cases.

Paraphrase:

Starvation seems like an unlikely candidate for the major factor controlling population because, except for occasional accidents of weather resulting in droughts or severe cold which starve out a population, starvation in most animal communities is rare.

00147

Yet the density of population in the majority of habitats does depend directly on the size of the food supply; the close relation of one to the other is clear in representative situations where both variables have been measured. We have, then, the situation that no individual starves but the population does not outgrow the food supply available in its habitat under normal conditions.

Understanding_____

00148

Yet the density of population in the majority of habitats does depend directly on the size of the food supply; the close relation of one to the other is clear in representative situations where both variables have been measured. We have, then, the situation that no individual starves but the population does not outgrow the food supply available in its habitat under normal conditions.

Paraphrase:

Although starvation in animal communities is rare, the population density does vary directly with the size of the food supply available.

00149

For many of the higher animals one can see therefore that neither predators, disease nor starvation can account for the regulation of numbers. There is of course accidental mortality, but it strikes in unpredictable and haphazard ways, independently of population density, and so must be ruled out as a stabilizer of population. All these considerations point to the possibility that the animals themselves must exercise the necessary restraint!

Understanding_____

00150

For many of the higher animals one can see therefore that neither predators, disease nor starvation can account for the regulation of numbers. There is of course accidental mortality, but it strikes in unpredictable and haphazard ways, independently of population density, and so must be ruled out as a stabilizer of population. All these considerations point to the possibility that the animals themselves must exercise the necessary restraint!

Paraphrase:

It may be that animals themselves exercise the necessary restraint in regulating their population. Since neither predators, disease nor starvation perform this function, and since accident mortality, though it certainly occurs, happens haphazardly and is thus independent of population density.

00151

Man's own history provides some vivid examples of what is entailed here. By overgrazing he has converted once rich pastures into deserts; by overhunting he has exterminated the passenger pigeon and all but eliminated animals such as the white whale, the southern fur seal and, in many of their former breeding places, sea turtles; he is now threatening to exterminate all five species of rhinoceros inhabiting tropical Africa and Asia because the horns of those animals are valued for their alleged aphrodisiac powers. Exploiting the riches of today can exhaust and destroy the resources of tomorrow. The point is that animals face precisely this danger with respect to their food supply, and they generally handle it more prudently than man does.

Understanding_____

00152

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Paraphrase:

Man has not shown restraint in using available natural resources. Due to overgrazing, extermination of animals by overhunting, and elimination of species of exotic purposes, man is left with deserts and depleted animal species. Animals face the same problem with respect to their food supply but they handle it with much more restraint than humans.

Birds feeding on seeds and berries in the fall or chickadees living on hibernating insects in winter are in such a situation. The stock of food to begin with is so abundant that it could feed an enormous population. Then, however, it would be gone in hours or days, and the birds must depend on this food supply for weeks or months. To make it last through the season the birds must restrict the size of their population in advance. The same necessity holds in situations where unlimited feeding would wipe out the sources that replenish the food supply. Thus the threat of starvation tomorrow, not hunger itself today, seems to be the factor that decides what the density of a population ought to be. Long before starvation would otherwise occur, the population must limit its growth in order to avoid disastrous overexploitation of food resources.

Understanding_____

00154

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Paraphrase:

The factor that seems to determine the population density is the threat of starvation in the future not present hunger. Although for birds feeding on seeds and berries in the fall the stock of food is so abundant it could feed a huge population; at the fall rate of consumption the food would be gone in a matter of days rather than the weeks or months it will have to last. Thus, the population must limit its growth in advance in order to avoid overexploitation of its food resources.

00155

All this implies that animals restrict their population density by some artificial device that is closely correlated with the food supply. What is required is some sort of automatic restrictive mechanism analogous to the deliberate conventions or agreements by which nations limit the exploitation of fishing grounds.

Understanding_____

00156

All this implies that animals restrict their population density by some artificial device that is closely correlated with the food supply. What is required is some sort of automatic restrictive mechanism analogous to the deliberate conventions or agreements by which nations limit the exploitation of fishing grounds.

Paraphrase:

To explain animals' restriction of population density there must be some restrictive mechanism that is closely correlated with food supply. Perhaps the mechanism would be analogous to the agreements by which nations limit exploitation of fishing grounds.

00157

One does not need to look far to realize that animals do indeed possess conventions of this kind. The bestknown is the territorial system of birds. The practice of staking out a territory for nesting and rearing a family is common among many species of birds. In the breeding season each male lays claim to an area of not less than a certain minimum size and keeps out all other males of the species; in this way a group of males will parcel out the available ground as individual territories. If a male is unsuccessful in gaining a territory he will be forced to leave the area, thus limiting overcrowding. This is a perfect example of an artificial mechanism geared to adjusting the density of population to the food resources. Instead of competing directly for the food itself the members compete furiously for pieces of ground, each of which then becomes the exclusive food preserve of its owner. If the standard territory is large enough to feed a family, the entire group is safe from the danger of overtaxing the food supply.

Understanding_____

00158

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Paraphrase:

The territorial system of birds which involves staking out a territory for nesting and rearing a family provides an example of a convention that restricts the population size. According to the convention of territoriality a group of males in a species compete for individual territories in the available ground, thus putting a limit on crowding. If these territories contain sufficient food to feed a family then the entire group is safe.

00159

Further Practice on Deciding When to Use Your Connection Technique

If there are no questions, you will now go through another Scientific American article in exactly the same way. At the end of this article you will be given a test to see how well you have done.

You have 15 minutes to go through the next section of paragraphs. Please stop if you reach the next set of instructions before time is called.

Remember, if your understanding rating is 6 or less form an unusual, "shorthand" connection, and make this connection cumulative whenever possible. The more connections you form, the better your chances are for recalling the information during the test.

Any Questions!

00160/162

When I was a young lecturer in zoology at the Univeristy of Leyden 20 years ago, I was asked to organize a laboratory course in animal behavior for undergraduates. In my quest for animals that could be used for such a purpose, I remembered the sticklebacks I had been accustomed as a boy to catch in the ditches near my home and to raise in a backyard aquarium. It seemed that they might be ideal laboratory animals. They could be hauled in numbers out of almost every ditch; they were tame and hardy and small enough to thrive in a tank no larger than a hatbox.

Understanding_____

00162

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Paraphrase:

Sticklebacks make ideal laboratory animals because they are plentiful, tame, hardy, and require little space.

I soon discovered that in choosing these former pets I had struck oil. They are so tame that they submit unfrightened to laboratory experiments, for the stickleback, like the hedgehog, depends on its spines for protection and is little disturbed by handling. Furthermore, the stickleback turned out to be an excellent subject for studying innate behavior, which it displays in some remarkably dramatic and intriguing ways. We found it to be the most reliable of various experimental animals that we worked with (including newts, bees, water insects and birds), and it became the focus of a program of research in which we now use hundreds of sticklebacks each year. The stickleback today is also a popular subject in various other zoological laboratories in Europe, notably at the universities in Groningen and Oxford. To us this little fish is what the rat is to many American psychologists.

Understanding_____

00164

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Paraphrase:

Sticklebacks make great experimental subjects. They are not disturbed by handling because they have spines for protection. Further they exhibit intriguing, and reliable, innate behavior.

My collaborator J. van Iersel and I have concentrated on the stickleback's courtship and reproductive behavior. The sex life ot the three-spined stickleback (Gasterosteus aculeatus) is a complicated pattern, purely instinctive and automatic, which can be observed and manipulated almost at will.

Understanding_____

00166

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Paraphrase:

The stickleback's sex life, which is complicated but automatic, can be easily observed and manipulated.

00167

In nature sticklebacks mate in early spring in shallow fresh waters. The mating cycle follows an unvarying ritual, which can be seen equally well in the natural habitat or in our tanks. First each male leaves the school of fish and stakes out a territory for itself, from which it will drive any intruder, male or female. Then it builds a nest. It digs a shallow pit in the sand bottom, carrying the sand away mouthful by mouthful. When this depression is about two inches square, it piles in a heap of weeds, preferably thread algae, coats the material with a sticky substance from its kidneys and shapes the weedy mass into a mound with its snout. It then bores a tunnel in the mound by wriggling through it. The tunnel, slightly shorter than an adult fish, is the nest.

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Paraphrase:

The male stickleback begins its unvarying mating cycle by staking out a territory which it defends against intruders. It then builds a nest by digging a pit in the sand with its mouth. It fills the pit with weeds, coats them with a sticky substance from its kidneys and bores a tunnel through the mound of weeds. The tunnel, slightly shorter than an adult fish, is the nest.

00169

Having finished the nest, the male suddenly changes color. Its normally inconspicuous gray coloring had already begun to show a faint pink blush on the chin and a greenish gloss on the back and in the eyes. Now the pink becomes a bright red and the back turns a bluish white.

Understanding_____

00170

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Paraphrase:

Before nest building the male stickleback is gray in color. During nest building the back and eyes turn greenish and the chin pink. After nest building the chin becomes a bright red and the back bluish white.

00171

In this colorful, conspicuous dress the male at once begins to court females. They, in the meantime, have also become ready to mate: their bodies have grown shiny and bulky with 50 to 100 large eggs. Whenever a female enters the male's territory, he swims toward her in a series of zigzags--first a sideways turn away from her, then a quick movement toward her. After each advance the male stops for an instant and then performs another zigzag. This dance continues until the female takes notice and swims toward the male in a curious head-up posture. He then turns and swims rapidly toward the nest, and she follows. At the nest the male makes a series of rapid thrusts with his snout into the entrance. He turns on his side as he does so and raises his dorsal spines toward his mate. Thereupon, with a few strong tail beats, she enters the nest and rests there, her head sticking out from one end and her tail from the other. The male now prods her tail base with rhythmic thrusts, and this causes her to lay her eggs. The whole courtship and egg-laying ritual takes only about one minute. As soon as she has laid her eggs, the female slips out of the nest. The male then glides in quickly to fertilize the clutch. After that he chases the female away and goes looking for another partner.

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Paraphrase:

With his red chin and bluish back the male is ready to court females. He waits for one fat with 50 to 100 eggs to enter his territory and woos her with a zigzag dance until she takes notice of him by lifting her head. The male then swims to the nest and indicates the entrance. The female enters and lays her eggs to the accompaniment of rhythmic thrusts at her tail base by the male's head. As soon as the eggs are laid the male fertilizes them, chases the female off, and waits for another.

C0173

One male may escort three, four or even five females through the nest, fertilizing each patch of eggs in turn. Then his mating impulse subsides, his color darkens and he grows increasingly hostile to females. Now he guards the nest from predators and "fans" water over the eggs with his breast fins to enrich their supply of oxygen and help them to hatch. Each day the eggs need more oxygen and the fish spends more time ventilating them. The ventilating reaches a climax just before the eggs hatch. For a day or so after the young emerge the father keeps the brood together, pursuing each straggler and bringing it back in his mouth. Soon the young sticklebacks become independent and associate with the young of other broods.

Understanding_____

00174

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Paraphrase:

One male may fertilize the eggs from three to five females. After this his mating impulse subsides and his color darkesn. He now guards the nest, fanning it with his fins until the eggs hatch. After the eggs hatch he keeps the small fry together for a day or two. Following this the young leave the father to associate with other young sticklebacks.

To get light on the behavior of man, particularly his innate drives and conflicts, it is often helpful to study the elements of behavior in a simple animal. Here is a little fish that exhibits a complicated pattern of activities, all dependent on simple stimuli and drives. We have studied and analyzed its behavior by a large number of experiments, and have learned a good deal about why the stickleback behaves as it does.

Understanding_____

00176

To get light on the behavior of man, particularly his innate drives and conflicts, it is often helpful to study the elements of behavior in a simple animal. Here is a little fish that exhibits a complicated pattern of activities, all dependent on simple stimuli and drives. We have studied and analyzed its behavior by a large number of experiments, and have learned a good deal about why the stickleback behaves as it does.

Paraphrase:

The value of studying the complicated, innate behavior of the sticklebacks is that it may shed light on much of the innate conflicts and drives in man.

00177

Let us begin with the stimulus that causes one stickleback to attack another. Early in our work we noticed that a male patrolling its territory would attack a red-colored intruder much more aggressively than a fish of some other color. Even a red mail van passing our windows at a distance of 100 yards could make the males in the tank charge its glass side in that direction. To investigate the reactions to colors we made a number of rough models of sticklebacks and painted some of the dummies red, some pale silver, some green. We rigged them up on thin wires and presented them one by one to the males in the tank. We found that the red models were always more provoking than the others, though even the silvery or green intruders caused some hostility.

Understanding_____

00178

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Paraphrase:

The color red is apparently the cue that causes a male stickleback to attack. Male sticklebacks will show hostility to variously colored fish models, but will generate the most hostility towards red models.

00179

In much the same way we tested the influence of shape, size, type of body movement and other stimuli, relating them to specific behavior in nest building, courting, attack, zigzag, fanning and so on. We discovered, for example, that a male swollen with food was courted as if it were a female.

Understanding _____

00180

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Paraphrase:

A number of experiments, similar to the ones using colored fish models, have been conducted to determine what cues or stimuli key off certain aspects of the mating cycle. For example, it was found that a swollen male was courted as if a female.

00181

As our work proceeded, we saw that the effective stimuli differed from one reaction to another, even when two reactions were caused by the same object. Thus a female will follow a red model wherever it leads; she will even make frantic efforts to enter a non-existent nest wherever the model is poked into the sand. Once she is in a real nest, she can be induced to spawn merely by prodding the base of her tail with a glass rod, even after she has seen the red fish that led her there removed. At one moment the male must give the visual signal of red; at the next, this stimulus is of no importance and only the tactile sensation counts. This observation led us to conclude that the stickleback responds simply to "sign stimuli," i.e., to a few characteristics of an object rather than to the object as a whole. A red fish or a red mail truck, a thrusting snout or a glass rod--it is the signal, not the object, that counts. A similar dependence on sign stimuli, which indicates the existence of special central nervous mechanisms, has been found in other species. It seems to be typical of innate behavior, and many social relationships in animals apparently are based on a system of signs.

Understanding_____

00182

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Paraphrase:

Experimentation has shown that the stickleback responds to a few characteristics of an object rather than an object as a whole. For example, a female will follow a red model into a nest and will spawn in response to the tapping of her tail base with a glass rod even if she has seen the red fish removed. Apparently it is the signal, not the object,that counts.

Connection Training Test Instructions

You have 5 minutes to answer the 15 questions on the next two pages. If you encounter a question that you cannot answer immediately, remember to use the retrieval techniques that were discussed early in the training program. That is, use the incidental and organizational connections that you have formed to arrive at the answer. If this doesn't work in a reasonable amount of time, go on to the other questions and return to the troublesome one later. New and useful connections may have been uncovered in answering the other questions.

00184

1) The male stickleback entices a female to his nest by going through a series of _____ movements.

2) The mating cycle of the stickleback changes depending on water conditions.

True____ False____

3) We study sticklebacks in order to shed light on the _____ of man.

4) The male stickleback carefully chooses his mate.

True____ False____

5) Sticklebacks will only respond sexually to other sticklebacks.

True____ False____

6) To enrich the supply of oxygen to the eggs and help them hatch, the male _____ water.

7) The _____ stickleback guards the young after birth.

8) For a male, red seems to elicit a(n) _____ response whereas a female will _____ a red stimulus.

9) The tunnel-like structure is a stickleback's _____.

10) A sign stimulus which leads the male to prod the female's tail base may be the female's _____ _____.

11) Being hardy, tame and easy to acquire, the stickleback is an ideal subject for _____ _____.

12) The stickleback is an especially good subject for the study of _____ behavior.

00185

13) A change of color signifies that the stickleback has finished his _____.

14) Since the stickleback depends on its spines for protection, one must be careful when handling it.

True____ False____

15) Once the male has courted one female and fertilized her eggs, his mating impulse subsides.

True____ False____

00186

CONCENTRATION TRAINING MATERIALS

(FOR USE UNDER AUDIO DISTRACTION CONDITIONS)

Please insert blank pages at appropriate places prior to using this section

Estimated Time for Included Materials is 55 Minutes

00187

Concentration Training Instructions

In the previous sessions, you have learned a connection technique which will substantially help you to understand and remember what you have read. You may have noticed that when you are using this technique, you are better able to concentrate. Why is this? Well, concentration requires focusing your attention on some particular thing while blocking out everything else that is happening around you. This is exactly what the connection technique forces you to do. By actively applying the technique, you are forced to focus your attention on what you are reading. The more actively involved you are in applying the technique, the less you attend to distractions.

Developing the ability to tune out distractions is an extremely important part of improving the efficiency and effectiveness of your studying. To help you develop this ability even further, we are going to ask you to read some passages and do your connection technique while simultaneously hearing some distracting tapes.

The first tape is a recording of a lecture, the second is a recording of a play, and the third is a recording of a somewhat bizarre play containing some rather wierd sounds. The volume of each of these three recordings will be increased as we go along.

Now, while hearing each of these distracting tapes you will be reading a passage similar to those you have just

00188

completed. Again, you are to make your understanding ratings in the blanks provided, if your rating is 6 or less you are to form an unusual "short hand" connection (you may write your connection in the margins of the reading material). If in doubt, it is better to do more connections than you think are necessary. You will be given 12 minutes to read each of the three passages. If you finish early do not go on to the next passage. However, you may go back and review if you like. One good way of reviewing is to go over each of the connections you have formed. After we have completed all three passages you will be tested over the material.

Any Questions?

00189

In its frantic attempts to provide itself food, shelter, and other comforts, the human species is ravaging the earth's thin skin of life. Lumbering has nearly shaved the continents of their forest mantles. North America, Russia, and a few small nations still retain forest reserves, but demand for pulp, building materials, and wood annually shrinks the planet's remaining acreage of trees. Reforestation in the United States is not keeping up with deforestation. If forests were only vertical columns of wood, the problems would not be so great, but they are much more. Forests harbor most of the planet's species of animals and plants, they protect and produce topsoil, and they conserve water by preventing rapid runoff. Man, in his frenzy of breeding and feeding, is destroying his life-support systems. Deforestation has lowered water tables throughout the world and may be the reason for the drying out of many parts of the tropics.

Understanding_____

Rational land-use programs rarely are instigated. Instead, the best is made of a worsening situation. Industry has exploited rapid runoff from deforested, eroding lands with hydroelectric dams. Farmers have learned to exploit the silt-laden flood waters from deforested lands hundreds and even thousands of miles away. Often both groups vehemently resist reforestation because it would jeopardize their supply of runoff waters for turbines and irrigation. In the meantime, topsoil is lost at alarming rates. Thousands of years may be needed to accumulate an inch of topsoil. Due to poor agricultural practices, the loss in some places today can be measured in inches per year. About 1 percent per year disappears from best farmland.

Understanding_____

Complex ecosystems such as forests and savannas are homeostatic systems. A change in the numbers of a few species or a gradual shift in climate can be compensated. These ecosystems can survive for eons. Man destroys these ecosystems with their shock-absorbing feedback properties. In their place he puts a single-species ecosystem--a crop. The crop needs constant protection and care. It has none of the homeostasis of a natural ecosystem. It can be devoured by an invasion of a single insect species. Winds can knock down the feebly rooted, quickly grown plants. Irrigation may be needed to supplement precipitation. Early rains may wash away the seedlings. Late rains may cause the plants to rot. If the crop is successfully harvested and stored, up to one-third or even one-half will be consumed by insects and rodents. And, finally, nutrients removed from the soil by harvesting must be replenished. No wonder an Iowa farmer expends more calories in petroleum fuel than he produces in grain. Only a rich nation can afford a gasoline-based agriculture.

The farmer is never more than a stride ahead of calamity; neither is the world. The loss of a single summer's crop in the northern hemisphere would exhaust humanity's slim margin of survival. Only North America has enough food stored to withstand such a disaster. This possibility is not as remote as it sounds. In 1815 the volcano Tombura on Sumbawa threw 150 cubic kilometers of ash into the atmosphere. There was no summer in much of the northern hemisphere the following year.

Attempts to feed today's population and the 72 million mouths added annually result in the addition of more tiers to the shaky tower of the simplified ecosystem. Modern agriculture now is totally dependent on artificial additives - pesticides and inorganic fertilizers. In turn, these create other stresses.

Understanding_____

Pesticides are powerful agents of natural selection. When they are applied, the most susceptible insects die, leaving the least susceptible to reproduce. Because selection promotes the evolution of resistance in pesticide targets, it becomes necessary to increase the dose and frequency of spraying, thus intensifying the selection on the target organisms and increasing environmental contamination. Resistance to the three major groups of insecticides (chlorinated hydrocarbons, organic phosphates, and carbamates) now is so widespread that crops of many kinds are on the verge of collapse. In some areas, withdrawal of pesticides is the best solution. Natural pest control can reassert itself--as happened, for example, in the cocoa crop in the state of Sabah, Malaysia (Conway, 1969). Sprayings were not preventing the defoliation and death of many trees. Because the worst insect outbreaks began after the introduction of a heavy spraying program, it was decided to stop application of pest species.

Unfortunately, such experiments are uncommon, and farmers everywhere are increasingly becoming slaves of pesticides. The evolution of resistance by pests necessitates heavier and heavier sprayings. Frequent substitutions of new, more deadly pesticides also are encouraged. It is a vicious cycle--a cycle promoted by the ecologically disastrous recommendations of the pesticide industry.

Understanding_____

00191

But these are only the direct effects. The indirect effects of pesticides are more in the public consciousness. One group of pesticides, the chlorinated hydrocarbons (including DDT, DDD, dieldren, and lindane), is highly resistant to oxidation and enzymatic attack. This resistance, plus relative insolubility in water, results in the accumulation of these substances in the tissues of exposed organisms. With some important exceptions, including insect strains with evolved resistance, organisms cannot dispose of chlorinated hydrocarbons as they do natural wastes and toxins. Predators and filter feeders at the top of food chains naturally accumulate the most. Many predatory and oceanic bird populations now are on the verge of extinction. It is still too early to predict what effects will result from the high pesticide levels in whales, porpoises, sea birds, fishes, crabs, shellfishes, and men. Further, no one knows what will be the effect of eliminating top predators from the ocean. In 1971 the United States government, despite lip service to environmental quality and research, is planning to pump more into research on diseases primarily affecting the aged (cancer and heart disease), while insignificant funds are available to assess to ecological deterioration.

Agricultural collapse and widespread famine immediately would follow a sudden turmination of pesticide use. Insect-borne disease also would increase significantly. According to statistics of the World Health Organization, about 10 million people have been saved from fatal effects of malaria by the use of DDT in antimosquito compaigns. To escape from the horns of this ecological dilemma will require time, intelligence, and--above all--research. The latter requires the support of an alert public.

Understanding_____

00192

Gulls live in flocks. They forage together the year around and nest together in the breeding season. No external force or agency compels them to this behavior; they assemble and stay together in flocks because they respond to one another. Their gregarious and often co-operative behavior is effected through communication. Each individual exhibits a considerable repertory of distinct calls, postures, movements and displays of color that elicit appropriate responses from other members of its species. Some gulls have a special food call that attracts their fellow gulls, and most have an alarm call that alerts the others. On the breeding grounds the male gull scares other males from its territory by certain calls and postures. Sex partners stimulate each other by a ritual of displays that leads to precisely timed and oriented co-operation in mating. Parent gulls attract their chicks by uttering the "mew call" or "crooning call" and lowering the beak. The chick pecks at the tip of the beak, and this stimulates the parent to regurgitate the food it has brought to the nest.

Understanding

Even a nodding acquaintance with gulls suggests that their signaling behavior is just as typical of the family as their coloring and other physical conformation. Under the same circumstances the members of a given species invariably strike the same posture or act out the same ritual. Such observations suggest that signaling behavior must be largely unlearned. Investigators have found, in fact, that it is highly "environment-resistant." When a young bird is raised away from its parents or with foster parents, it does not develop a different pattern of signaling behavior but displays the repertory peculiar to its species. Moreover, gulls "understand" the meaning of various signals, apparently without the necessity of learning. The fact that many signaling movements of animals are as typical of the species as are anatomical structures and physiological mechanisms has been repeatedly stressed by Konrad Z. Lorenz.

When our group at the University of Oxford began some years ago to study the signaling behavior of gulls, we were interested primarily in finding out how the system works. We were concerned with such questions as: What is the exact function of each display? What makes a gull give a particular signal? But it was not long before another question claimed our interest. The members of our group had been working at many sites around the world and observing the habits of 15 or more species of gull. We had found that the signaling systems of these species are very similar; this strengthened the conclusion, drawn from structural similarity,

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that gulls must have evolved from a common ancestral species. But we also found that the signaling repertories of the various species differ from one another in significant ways. Since the differences among these closely related birds are not induced by the environment, but are truly innate, it was clear that the present differences among the species must have arisen through evolutionary divergence. We decided that a comparative study of the signaling of the gulls might yield fresh insight into the evolution of their behavior.

Understanding_____

Much as the anatomist makes comparative studies of structures in order to discover the origins and relationships of species, we have been conducting a comparative study of the signaling systems of gulls. These systems provide excellent instances for the study of behavior; precisely because of the function they serve, the signals are distinct and plain enough to be recognized even by an attentive human being. In our program the comparative method is applied in combination with our earlier methods of study. We continue to investigate the form and motivation of the displays, and this work has been facilitated by recent improvements in technique. We continue also to be concerned with the function of the displays, for this bears upon their survival value and so allows us to trace the selection pressures which must have been at work molding them. Thus the comparative study of the differences among species and the comparison of the present displays and their apparent origins make it possible to approach a description of the evolutionary changes that must have occurred as the ancestral gull family split up into the present 35 or so species of different appearances, habits and distribution.

Understanding_____

Since there is no fossil behavior to certify our conclusions, our method of study might better be compared to that by which modern linguistics, through comparative study of languages, has worked out the family tree of the Indo-European languages, and has even reconstructed parts of the original Indo-European language. The findings of such a study must always be regarded as probabilistic. On the other hand, the data of our investigation are sufficiently clear-cut. The postures and displays of each species are distinct and constant enough to make them useful in distinguishing and identifying the species.

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Eight postures and movements occur in nearly all species of gull in more or less modified form. When they are employed for taxonomic purposes, they greatly increase the number of characteristics by which gulls may be classified. The similarities and differences among the displays of the major sub-groups correspond roughly to the classifications of the taxonomist, although studies of some of the less well-known species might force revision of their status. All of the "large gulls," among which the most familiar is the herring gull, have quite similar signaling systems. The "hooded gulls" are rather different from these, yet they are close in their habits to one another. Species that have been placed in separate genera, such as the kittiwake and the ivory gull, have correspondingly distinct displays.

Understanding_____

It seems clear that the signaling movements originated in more elementary behavior patterns, such as attacking, escaping, mating and nest-building. The postures and the actions themselves suggest where they came from. "Grass pulling" is a good example. In contests over territorial boundaries herring gulls and other large gulls often peck violently at the ground, uproot plants and toss them sideways with a flick of the head. The pecks are indistinguishable from those aimed at rivals in actual attacks, and the pulling movements are identical with those seen when a gull seizes an opponent's wing, bill or tail. But the strange thing is that this activity is directed at the ground, not at the intruder for whose benefit the signal is displayed. The technical term for this is "redirected attack," and it may be compared to the human tendency to bang a table with the fist or kick a chair when angered. More puzzling is the sideways flick of the head that terminates this action. It is familiar to anyone who has observed gulls through more complete cycles of behavior; all gulls (and other birds as well) perform this movement when they build material into the nest. Apparently the sideways flick is stimulated by the "nest material" that the bird finds in its bill following its attack on the ground. Grass pulling may therefore be described as a redirected attack followed by a displaced nest-building movement.

Understanding_____

Men have occupied the Great Plains of the West for a good ten thousand years or more. They came in, apparently, when the last ice sheet was in its northward retreat, and their archaeological culture seems to have been fairly stable over long periods of time. But the horse-riding, buffalo-hunting, tipi-dwelling culture of the eighteenth-century Plains Indian was something quite new in its development.

Before the coming of Columbus the Indians of the Plains were largely riverbound and not overly inclined to venture afar into the vast, poorly watered stretches of open grasslands. They had to go afoot.

The coming of the European altered the situation with drastic effect. The Spaniard to the south introduced the horse and thereby provided the means for extensive penetration of the Plains by native populations, for which the thick herds of buffalo and fleet antelope were an enticing lure. On the eastern frontier the French and British were working to cause a far-reaching displacement of the Woodland tribes. White settlements forced some tribes to move westward at an early date. And out beyond the frontier, other displacements were accelerated ahead of the line of settlement by the imperialistic rivalry of the fur trade.

Understanding_____

The fur trading tribes sought ever to enlarge their trapping and hunting domains at the expense of some of their neighbors. The British companies encouraged their tribes to drive off the French-allied tribes, and they gave them guns wherewith to do it. The French responded in kind, and the tribes of either party used their new weapons to drive the unarmed tribes on the western frontier before them. Thus with pressure behind them and an attractive lure before them, a number of the tribes of the Mississippi Valley sought sanctuary and prosperity in the relatively unpopulated lands of the West. The Cheyennes were among them.

Prior to 1600 the Cheyennes were a simple food-gathering people who lived in the lake country near the headwaters of the Mississippi. Shortly after the opening of the century they began moving westward until they came to the Missouri River in the Dakotas. Here they settled into earth-lodge villages and took to tilling corn in the manner they learned from the Arikara tribe. Toward the end of the eighteenth century they were moving on again, this time out into the Plains to become a nomadic horse tribe.

Understanding_____

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The Comanches, on the other hand, appear in the sixteenth century to have occupied the country that lay around the headwaters of the Yellowstone and Missouri Rivers. They were an eastern branch of the far-flung Shoshonean group of tribes and at that time it is unlikely that they would have been distinguishable from other eastern Shoshoneans. But in the eighteenth century the Comanches moved down into the southern Plains, while the Shoshones were driven back over the Rocky Mountains by invaders from the east. The Comanches became a discrete entity and one of the first, if not the first, of the Plains tribes to acquire horses.

The Kiowas came into the Plains from the north at a fairly late date. Thus each of the three tribes came originally from areas peripheral to the Plains. Each carried a different language and cultural tradition into the new homeland. Yet the ferment of life on the Plains was such, and the interaction of the tribes so great, that in the details of subsistence and in the general features of clothing, housing, war, and religion they, like all the nomadic Plains tribes, developed broadly similar ways of life.

The Comanche cultural background was the most meager of the three. It was that of the so-called "Digger Indians" of the Great Basin. In the tradition of these tribes there was no great social organization. People moved and lived in small isolated family bands. Each was autonomous and economically self-sufficient on a low subsistence level. Religion was vaguely defined and almost wholly devoid of ceremonial structure. Arts were th[illegible], and life offered little of richer satisfactions. War w[illegible] thing to be avoided, for the Basin Shoshoneans had no mi[illegible]ry organization and were wholly lacking in fighting prowess.

Understanding_____

In the Plains the Comanches never wholly shed this heritage, but in the new setting they wrought some mighty changes in their way of life. With adequate food resources and the horse they were able to prosper in numbers and so to enlarge the size of their bands. Yet they never forsook band autonomy for tribal government. Religion remained to the very end almost wholly an individual enterprise with few group rituals and no tribal ceremonials.

00197

It was in warring and raiding that the great transformation took place. Out of apparent weakness emerged the wildest marauding brigandage. The Comanches whipped and drove the Apaches from the southern Plains. They stalemated the Spanish. They decimated the pueblo of Pecos. They ranged far below the Rio Grande on slave- and booty-taking raids into Old Mexico. They blocked the westward expansion of the Texas frontier for several decades. They became "The Spartans of the Prairies." They were rough, tough, aggressive and militant individualists. They gave trouble to all their enemies and to themselves. And in their way, out of the nothingness of Shoshone legal backgrounds they shaped a crude but effective system of law to cope with the clashes of individual with individual within their ranks.

Understanding_____

The Cheyennes were also militaristic. They, too, fought for booty and pleasure; the war cult was wholly theirs. They also acquired the horse and prospered on the buffalo. But somewhere in their background, deep in their Algonkian heritage, was a tradition that gave them a sense of form, a feel for structured order, a maturity of emotion and action. They lived without the Comanche's frenetic stridency and assertiveness.

The Cheyennes possessed a ritualized tribal government. They had a well-developed system of military societies. In the Sun Dance, Animal Dance, and Sacred Arrow Renewal ceremonies they possessed tribal rituals that served to express their consciousness of being as one people. In the performance of these great ceremonies they also enjoyed a common emotional experience that built a bond of common tribal loyalty. The Cheyennes were socialized in a way that the Comanches never approached. The Cheyenne law system was sedate and effective, calm and mature, when measured against the adolescence of Comanche behavior. Above all, in legal action the Cheyennes revealed a feeling for the social purposes of law.

Understanding_____

Concentration Test Instructions

You now have 15 minutes to answer the three sets of 15 questions contained on the next few pages. When you finish with one set of questions, immediately go on to the next. Remember, use the Retrieval Training Techniques on questions that you can't answer immediately. That is, use the incidental and organizational cues produced by the connections you have formed to dredge up the answers. Remember, it is often better to come back to difficult questions because new and useful connections may be discovered while answering other questions.

00199

Forests not only provide wood but also serve other valuable functions. List two.

1) _____

2) _____

3) The homeostasis of a crop offers compensation for the depletion of such natural ecosystems as forests and savannas.

True____ False____

4) Modern agriculture is totally dependent on artificial _____.

5) The building of hydroelectric dams seems to be a rational course of action to deal with deforestation.

True____ False____

6) Two groups which have resisted reforestation are _____ and _____.

7) Thousands of years may be needed to accumulate an inch of topsoil.

True____ False____

8) Topsoil disappears at a rate of _____ percent per year from the best farmland.

9) Compared to forests, crops are extremely fragile.

True____ False____

10) Pesticides must be used since natural pest control can no longer assert itself.

True____ False____

00200

11) It becomes necessary to increase the dose and frequency of pesticide spraying because the _____ _____ insects survive earlier spraying.

12) Currently, many people are concerned about the high levels of _____ accumulating in whales, birds and men.

13) The only solution to the problems associated with pesticide use is the immediate and total cessation of all pesticide use.

True____ False____

14) In 1971, the U.S. spent huge amounts of funds to assess ecological deterioration.

True____ False____

15) Lumbering may have caused the drying out of many parts of the tropics.

True____ False____

00201

1) Even a nodding acquaintance with gulls suggests that their _____ behavior is just as typical of the family as their coloring.

The author suggests there are four classes of signals used by gulls. One of these consists of "calls." Name two others:
(2)_____
(3)_____

4) A young gull raised by parents from a different species will make signals that are identical to those of his foster parents.
True_____ False_____

5) The gull learns to understand the signals of the other members of his flock.
True_____ False_____

6) Differences in signaling behavior between species of gulls must have been caused by _____ _____.

7) The investigators were not only interested in the similarities and differences of the signal systems of the 35 species of gulls, but also in the evolutionary history. Thus, the _____ method is being used in these studies.

8) For a human, the signals of the gulls are extremely difficult to identify.
True_____ False_____

9) "Large gulls" and "herring gulls" have quite different signal systems.
True_____ False_____

10) "Grass pulling" has been labeled as a "_____ attack."

11) The author described several signals displayed by gulls. How does a chick signal that he is hungry?
_____

12) The parent gull has already brought food to the nest by the time the chick signals that he is hungry.
True_____ False_____

00202

13) The investigators found it difficult to distinguish the kittiwake and the "hooded gulls" on the basis of signal display.

True____ False____

14) The behavior of gulls is characterized by cooperation. List one activity in which gulls cooperate.

_____

15) Signaling movements seem to have originated in more _____ behavior patterns such as attacking, escaping, mating and nest building.

00203

1) Plains Indians have always been dependent upon the hunting of buffalo for survival.

True___ False___

2) The introduction of the _____ by the Spaniards enabled the natives to penetrate the Plains more extensively.

3) The _____ was one of the first tribes of the Plains to acquire horses.

4) Due to initial language and cultural differences, the tribes which made up the nomadic Plains tribes developed styles of lives greatly different from one another.

True___ False___

5) The _____ tribe was characterized by a lack of social organization.

6) In contrast, the _____ formed a ritualized tribal government.

7) Once in the Plains, the Comanches increased the tribal organizations and ceremonies.

True___ False___

8) Displacements of tribes occurred due to white settlements and the imperialistic rivalry of the _____ _____.

9) The _____ of the Cheyennes helped unify the people of the tribe.

10) The Comanches developed a crude system of _____ after the transformation from avoiding war to becoming effective warriors.

00204

11) The immature and seemingly irrational legal system of the Comanches contrasted with the calm and mature system of the _____.

12) Even before the arrival of Columbus, the Plains Indians explored vast stretches of grass lands, afoot.
True_____ False_____

13) Both the British and the French encouraged cooperation among the tribes so as to ensure peace and increased fur trade.
True_____ False_____

14) The Cheyennes prior to 1600 were food-gathering people. They later began to till corn; toward the end of the 18th century, they became a _____ _____ tribe.

15) After the coming of the _____, the tribes of the Mississippi Valley sought sanctuary and wealth in the western territories.

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